

Altium Education Series

***Protel*DXP<sup>TM</sup>**

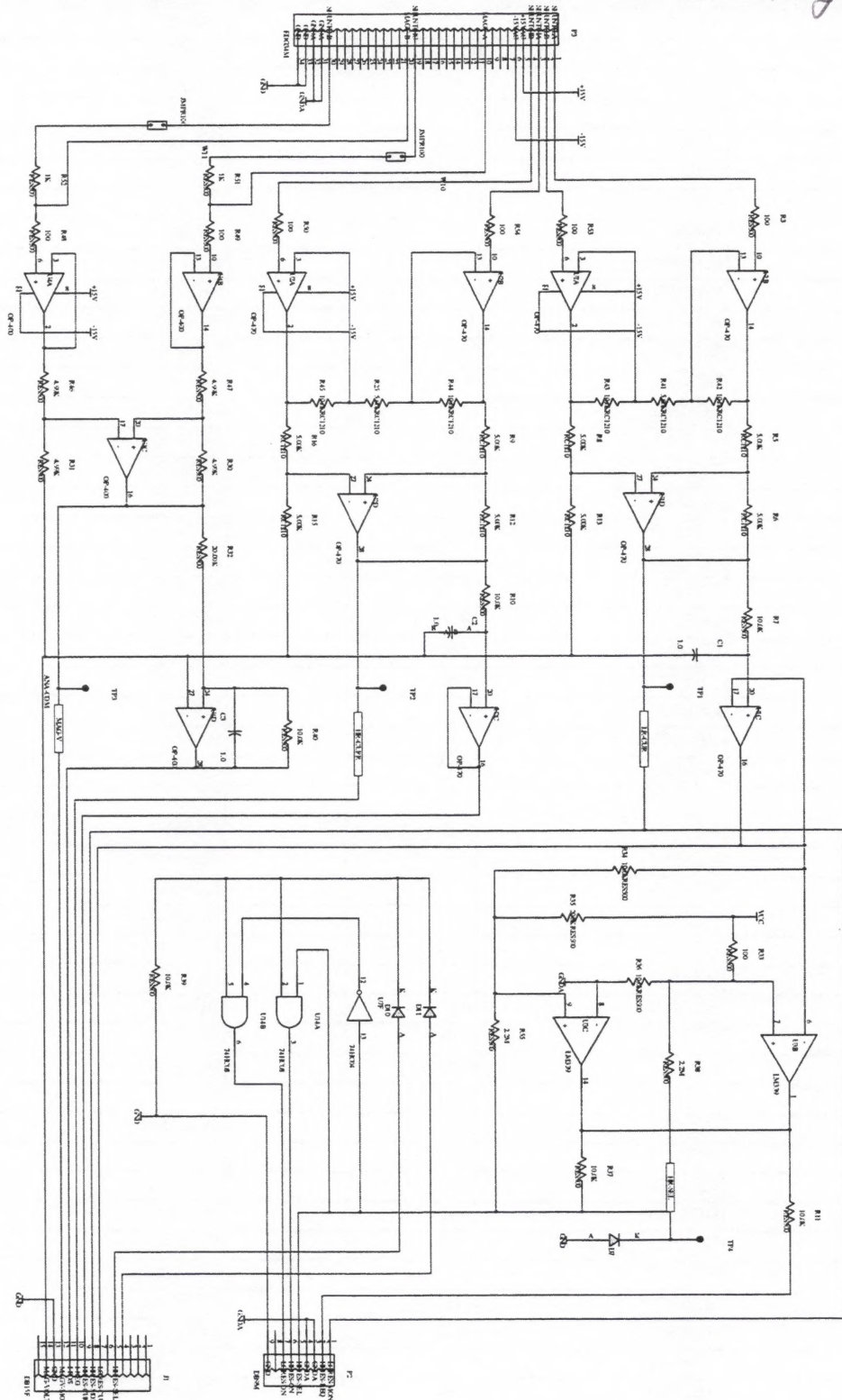
Hands-On  
Training Workbook



~~Control~~ - Control key + Drag <sup>part</sup> ~ Rubberbands Wire

- Space bar → Rotates

- Parts are intersheet  
Connectivity



Pin	Signal	Value
1	VCC	5V
2	GND	0V
3	IN1	0V
4	IN2	0V
5	OUT	0V
6	VCC	5V
7	GND	0V
8	IN1	0V
9	IN2	0V
10	OUT	0V
11	VCC	5V
12	GND	0V
13	IN1	0V
14	IN2	0V
15	OUT	0V
16	VCC	5V
17	GND	0V
18	IN1	0V
19	IN2	0V
20	OUT	0V
21	VCC	5V
22	GND	0V
23	IN1	0V
24	IN2	0V
25	OUT	0V
26	VCC	5V
27	GND	0V
28	IN1	0V
29	IN2	0V
30	OUT	0V

## Train 1 - Bill of Materials Report Generated From DXP

Quantity	LibRef	Designator	Footprint	Comment
1	CAP100	C1	CAP100	1.0
1	CAP100	C2	CAP100	1.0
1	CAP100	C3	CAP100	1.0
1	1N5819	D7	DO-41	1N5819
1	1N5819	D10	DO-41	1N5819
1	1N5819	D11	DO-41	1N5819
1	DB15F	J1	DB15F	
1	DB9M	P2	DB9M	
1	EDG34M	P3	EDGE34/100	
1	RES500	R3	RES500	100
1	RC1210	R5	RC1210	5.00K
1	RC1210	R6	RC1210	5.00K
1	RES500	R7	RES500	10.0K
1	RC1210	R8	RC1210	5.00K
1	RC1210	R9	RC1210	5.00K
1	RES500	R10	RES500	10.0K
1	RES500	R11	RES500	10.0K
1	RC1210	R12	RC1210	5.00K
1	RC1210	R13	RC1210	5.00K
1	RC1210	R15	RC1210	5.00K
1	RC1210	R16	RC1210	5.00K
1	RC1210	R25	RC1210	5.00K
1	RES500	R30	RES500	4.99K
1	RES500	R31	RES500	4.99K
1	RES500	R32	RES500	20.00K
1	RES500	R33	RES500	100
1	RES500	R34	RES500	10.0K
1	RES500	R35	RES500	200K
1	RES500	R36	RES500	10.0K
1	RES500	R37	RES500	10.0K
1	RES500	R38	RES500	2.2M
1	RES500	R39	RES500	10.0K
1	RES500	R40	RES500	10.0K
1	RC1210	R41	RC1210	5.00K
1	RC1210	R42	RC1210	10.0K
1	RC1210	R43	RC1210	10.0K
1	RC1210	R44	RC1210	10.0K
1	RC1210	R45	RC1210	10.0K
1	RES500	R46	RES500	4.99K
1	RES500	R47	RES500	4.99K
1	RES500	R48	RES500	100
1	RES500	R49	RES500	100
1	RES500	R50	RES500	100
1	RES500	R51	RES500	1K
1	RES500	R52	RES500	1K
1	RES500	R53	RES500	100
1	RES500	R54	RES500	100



Quantity	LibRef	Designator	Footprint	Comment
1	RES500	R55	RES500	2.2M
1	TESTPOINT	TP1	TESTPOINT	
1	TESTPOINT	TP2	TESTPOINT	
1	TESTPOINT	TP3	TESTPOINT	
1	TESTPOINT	TP4	TESTPOINT	
1	OP-470	U1	PLCC28A	
1	OP-470	U2	PLCC28A	
1	LM339	U3	DIP14	
1	OP-400	U4	PLCC28A	
1	74HC04	U7	DIP14	
1	74HC08	U14	DIP14	
1	JMPR100	W10	JMPR100	
1	JMPR100	W11	JMPR100	



Train1Bill of Materials  
Report Generated in Excel

Quantity	LibRef	Designator	Footprint	Comment
1	CAP100	C1	CAP100	1.0
1	CAP100	C2	CAP100	1.0
1	CAP100	C3	CAP100	1.0
1	1N5819	D7	DO-41	1N5819
1	1N5819	D10	DO-41	1N5819
1	1N5819	D11	DO-41	1N5819
1	DB15F	J1	DB15F	
1	DB9M	P2	DB9M	
1	EDG34M	P3	EDGE34/100	
1	RES500	R3	RES500	100
1	RC1210	R5	RC1210	5.00K
1	RC1210	R6	RC1210	5.00K
1	RES500	R7	RES500	10.0K
1	RC1210	R8	RC1210	5.00K
1	RC1210	R9	RC1210	5.00K
1	RES500	R10	RES500	10.0K
1	RES500	R11	RES500	10.0K
1	RC1210	R12	RC1210	5.00K
1	RC1210	R13	RC1210	5.00K
1	RC1210	R15	RC1210	5.00K
1	RC1210	R16	RC1210	5.00K
1	RC1210	R25	RC1210	5.00K
1	RES500	R30	RES500	4.99K
1	RES500	R31	RES500	4.99K
1	RES500	R32	RES500	20.00K
1	RES500	R33	RES500	100
1	RES500	R34	RES500	10.0K
1	RES500	R35	RES500	200K
1	RES500	R36	RES500	10.0K
1	RES500	R37	RES500	10.0K
1	RES500	R38	RES500	2.2M
1	RES500	R39	RES500	10.0K
1	RES500	R40	RES500	10.0K
1	RC1210	R41	RC1210	5.00K
1	RC1210	R42	RC1210	10.0K
1	RC1210	R43	RC1210	10.0K
1	RC1210	R44	RC1210	10.0K
1	RC1210	R45	RC1210	10.0K
1	RES500	R46	RES500	4.99K
1	RES500	R47	RES500	4.99K
1	RES500	R48	RES500	100
1	RES500	R49	RES500	100
1	RES500	R50	RES500	100
1	RES500	R51	RES500	1K
1	RES500	R52	RES500	1K
1	RES500	R53	RES500	100

1	RES500	R54	RES500	100
1	RES500	R55	RES500	2.2M
1	TESTPOINT	TP1	TESTPOINT	
1	TESTPOINT	TP2	TESTPOINT	
1	TESTPOINT	TP3	TESTPOINT	
1	TESTPOINT	TP4	TESTPOINT	
1	OP-470	U1	PLCC28A	
1	OP-470	U2	PLCC28A	
1	LM339	U3	DIP14	
1	OP-400	U4	PLCC28A	
1	74HC04	U7	DIP14	
1	74HC08	U14	DIP14	
1	JMPR100	W10	JMPR100	
1	JMPR100	W11	JMPR100	



Bill of Material for Train1.pcb

On 2/13/2003 at 11:30:48 AM

Comment	Pattern	Quantity	Components
	DB15F	15	J1, P2, P3, TP1, TP2, TP3 TP4, U1, U2, U3, U4, U7, U14 W10, W11
1.0	CAP100	3	C1, C2, C3
10.0K	RES500	12	R7, R10, R11, R34, R36, R37 R39, R40, R42, R43, R44, R45
100	RES500	7	R3, R33, R48, R49, R50, R53 R54
1K	RES500	2	R51, R52
1N5819	DO-41	3	D7, D10, D11
2.2M	RES500	2	R38, R55
20.00K	RES500	1	R32
200K	RES500	1	R35
4.99K	RES500	4	R30, R31, R46, R47
5.00K	RC1210	10	R5, R6, R8, R9, R12, R13, R15 R16, R25, R41



## Train2 Bill of Materials Report Generated From DXP

Quantity	LibRef	Designator	Footprint	Comment
1	CAP200	C1	CAP200	.1uF
1	CC1206	C2	CC1206	.1uF Film
1	CC1206	C3	CC1206	.1uF
1	CC1206	C4	CC1206	.1uF
1	CC1206	C5	CC1206	.1uF Film
1	CC1206	C6	CC1206	.1uF
1	CC1206	C7	CC1206	.1uF
1	CC1206	C8	CC1206	.1uF
1	CAP200	C9	CAP200	.1uF
1	CAP200	C10	CAP200	.1uF
1	CAP200	C11	CAP200	.1uF
1	CAP200	C12	CAP200	.1uF
1	CAP200	C13	CAP200	.1uF
1	CAP200	C14	CAP200	.1uF
1	CAP200	C15	CAP200	.1uF
1	CAP200	C16	CAP200	.1uF
1	CAP200	C17	CAP200	.1uF
1	CAP200	C18	CAP200	.1uF
1	CAP200	C19	CAP200	.1uF
1	CAP100RP	C20	CAP100RP	22 uF
1	CAP100RP	C21	CAP100RP	22 uF
1	CAP200	C22	CAP200	.1uF
1	CAP200	C23	CAP200	.1uF
1	CAP100RP	C24	CAP100RP	22 uF
1	CAP100RP	C25	CAP100RP	22 uF
1	DB9F	J1	DB9F	DB9F
1	DB9F	J2	DB9F	RS-485
1	DB9F	J3	DB9F	RS-232
1	JMP2	JP2	JMP2	JMP2
1	JUMPER	JP3	JUMPER	JUMPER
1	RES500	R1	RES500	121
1	RES500	R2	RES500	121
1	RES500	R3	RES500	511
1	RES500	R4	RES500	511
1	RES500	R5	RES500	511
1	RES500	R6	RES500	511
1	RES500	R7	RES500	10K
1	RES10SIPB	RN1	SIP10	10K
1	SWITCH8DIP	SW1	SW8POSRA	SWITCH8DIP
1	STATIC RAM	U1	DIP28N	STATIC RAM
1	PSD402A1	U2	PLCCSOCKET68	PSD402A1
1	STATIC RAM	U3	DIP28N	STATIC RAM
1	TN80C186EB	U4	PLCCSOCKET84	TN80C186EB
1	74OL6000	U5	DIP6	74OL6000
1	485 TRANSCEIVER	U6	DIP8	485 TRANSCEIVER
1	74OL6000	U7	DIP6	74OL6000
1	74OL6001	U8	DIP6	74OL6001

Quantity	LibRef	Designator	Footprint	Comment
1	485 TRANSCEIVER	U9	DIP8	485 TRANSCEIVER
1	74OL6000	U10	DIP6	74OL6000
1	74OL6000	U11	DIP6	74OL6000
1	MAX232	U12	DIP16	MAX232
1	JMP_3PIN	W1	JMP3	JMP_3PIN
1	OSC_8PIN	Y1	DIP8	32 MHZ
1	TRANSORB	Z1	RES600	12V
1	TRANSORB	Z2	RES600	12V
1	TRANSORB	Z3	RES600	12V
1	TRANSORB	Z4	RES600	12V
1	TRANSORB	Z5	RES600	36V
1	TRANSORB	Z6	RES600	36V



## Train 2 - Bill of Materials Report Generated From DXP

Quantity	LibRef	Designator	Footprint	Comment
1	CAP200	C1	CAP200	.1uF
1	CC1206	C2	CC1206	.1uF Film
1	CC1206	C3	CC1206	.1uF
1	CC1206	C4	CC1206	.1uF
1	CC1206	C5	CC1206	.1uF Film
1	CC1206	C6	CC1206	.1uF
1	CC1206	C7	CC1206	.1uF
1	CC1206	C8	CC1206	.1uF
1	CAP200	C9	CAP200	.1uF
1	CAP200	C10	CAP200	.1uF
1	CAP200	C11	CAP200	.1uF
1	CAP200	C12	CAP200	.1uF
1	CAP200	C13	CAP200	.1uF
1	CAP200	C14	CAP200	.1uF
1	CAP200	C15	CAP200	.1uF
1	CAP200	C16	CAP200	.1uF
1	CAP200	C17	CAP200	.1uF
1	CAP200	C18	CAP200	.1uF
1	CAP200	C19	CAP200	.1uF
1	CAP100RP	C20	CAP100RP	22 uF
1	CAP100RP	C21	CAP100RP	22 uF
1	CAP200	C22	CAP200	.1uF
1	CAP200	C23	CAP200	.1uF
1	CAP100RP	C24	CAP100RP	22 uF
1	CAP100RP	C25	CAP100RP	22 uF
1	DB9F	J1	DB9F	DB9F
1	DB9F	J2	DB9F	RS-485
1	DB9F	J3	DB9F	RS-232
1	JMP2	JP2	JMP2	JMP2
1	JUMPER	JP3	JUMPER	JUMPER
1	RES500	R1	RES500	121
1	RES500	R2	RES500	121
1	RES500	R3	RES500	511
1	RES500	R4	RES500	511
1	RES500	R5	RES500	511
1	RES500	R6	RES500	511
1	RES500	R7	RES500	10K
1	RES10SIPB	RN1	SIP10	10K
1	SWITCH8DIP	SW1	SW8POSRA	SWITCH8DIP
1	STATIC RAM	U1	DIP28N	STATIC RAM
1	PSD402A1	U2	PLCCSOCKET68	PSD402A1
1	STATIC RAM	U3	DIP28N	STATIC RAM
1	TN80C186EB	U4	PLCCSOCKET84	TN80C186EB
1	74OL6000	U5	DIP6	74OL6000
1	485 TRANSCEIVER	U6	DIP8	485 TRANSCEIVER
1	74OL6000	U7	DIP6	74OL6000
1	74OL6001	U8	DIP6	74OL6001

Quantity	LibRef	Designator	Footprint	Comment
1	485 TRANSCEIVER	U9	DIP8	485 TRANSCEIVER
1	74OL6000	U10	DIP6	74OL6000
1	74OL6000	U11	DIP6	74OL6000
1	MAX232	U12	DIP16	MAX232
1	JMP_3PIN	W1	JMP3	JMP_3PIN
1	OSC_8PIN	Y1	DIP8	32 MHZ
1	TRANSORB	Z1	RES600	12V
1	TRANSORB	Z2	RES600	12V
1	TRANSORB	Z3	RES600	12V
1	TRANSORB	Z4	RES600	12V
1	TRANSORB	Z5	RES600	36V
1	TRANSORB	Z6	RES600	36V





Train 2 Bill of Materials  
Report Generated in Excel

Quantity	LibRef	Designator	Footprint	Comment
1	CAP200	C1	CAP200	.1uF
1	CC1206	C2	CC1206	.1uF Film
1	CC1206	C3	CC1206	.1uF
1	CC1206	C4	CC1206	.1uF
1	CC1206	C5	CC1206	.1uF Film
1	CC1206	C6	CC1206	.1uF
1	CC1206	C7	CC1206	.1uF
1	CC1206	C8	CC1206	.1uF
1	CAP200	C9	CAP200	.1uF
1	CAP200	C10	CAP200	.1uF
1	CAP200	C11	CAP200	.1uF
1	CAP200	C12	CAP200	.1uF
1	CAP200	C13	CAP200	.1uF
1	CAP200	C14	CAP200	.1uF
1	CAP200	C15	CAP200	.1uF
1	CAP200	C16	CAP200	.1uF
1	CAP200	C17	CAP200	.1uF
1	CAP200	C18	CAP200	.1uF
1	CAP200	C19	CAP200	.1uF
1	CAP100RP	C20	CAP100RP	22 uF
1	CAP100RP	C21	CAP100RP	22 uF
1	CAP200	C22	CAP200	.1uF
1	CAP200	C23	CAP200	.1uF
1	CAP100RP	C24	CAP100RP	22 uF
1	CAP100RP	C25	CAP100RP	22 uF
1	DB9F	J1	DB9F	DB9F
1	DB9F	J2	DB9F	RS-485
1	DB9F	J3	DB9F	RS-232
1	JMP2	JP2	JMP2	JMP2
1	JUMPER	JP3	JUMPER	JUMPER
1	RES500	R1	RES500	121
1	RES500	R2	RES500	121
1	RES500	R3	RES500	511
1	RES500	R4	RES500	511
1	RES500	R5	RES500	511
1	RES500	R6	RES500	511
1	RES500	R7	RES500	10K
1	RES10SIPB	RN1	SIP10	10K
1	SWITCH8DIP	SW1	SW8POSRA	SWITCH8DIP
1	STATIC RAM	U1	DIP28N	STATIC RAM
1	PSD402A1	U2	PLCCSOCKET68	PSD402A1
1	STATIC RAM	U3	DIP28N	STATIC RAM
1	TN80C186EB	U4	PLCCSOCKET84	TN80C186EB
1	74OL6000	U5	DIP6	74OL6000

1	485 TRANSCEIVER	U6	DIP8	485 TRANSCEIVER
1	74OL6000	U7	DIP6	74OL6000
1	74OL6001	U8	DIP6	74OL6001
1	485 TRANSCEIVER	U9	DIP8	485 TRANSCEIVER
1	74OL6000	U10	DIP6	74OL6000
1	74OL6000	U11	DIP6	74OL6000
1	MAX232	U12	DIP16	MAX232
1	JMP_3PIN	W1	JMP3	JMP_3PIN
1	OSC_8PIN	Y1	DIP8	32 MHZ
1	TRANSORB	Z1	RES600	12V
1	TRANSORB	Z2	RES600	12V
1	TRANSORB	Z3	RES600	12V
1	TRANSORB	Z4	RES600	12V
1	TRANSORB	Z5	RES600	36V
1	TRANSORB	Z6	RES600	36V

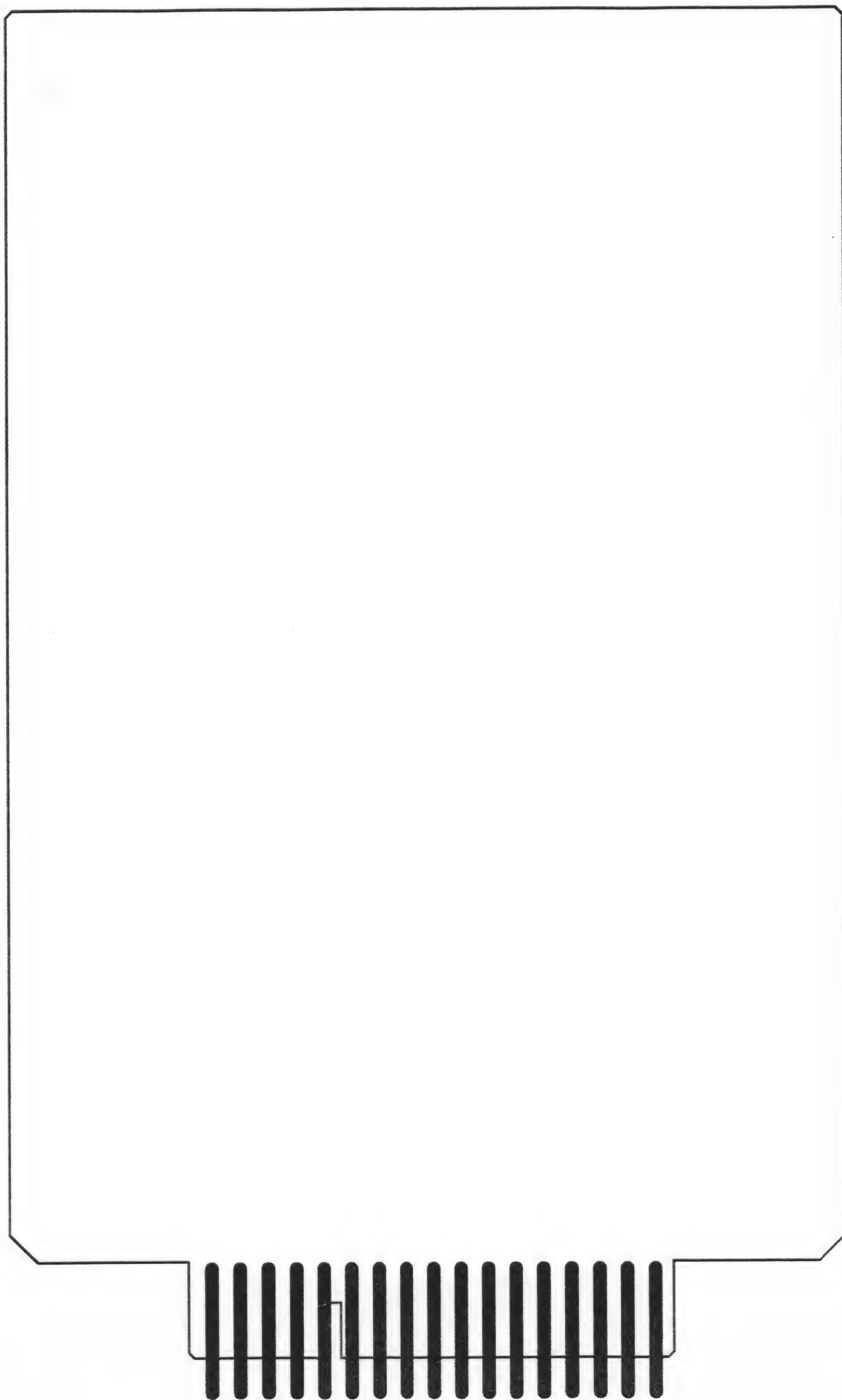
Bill of Material for Train2.pcb

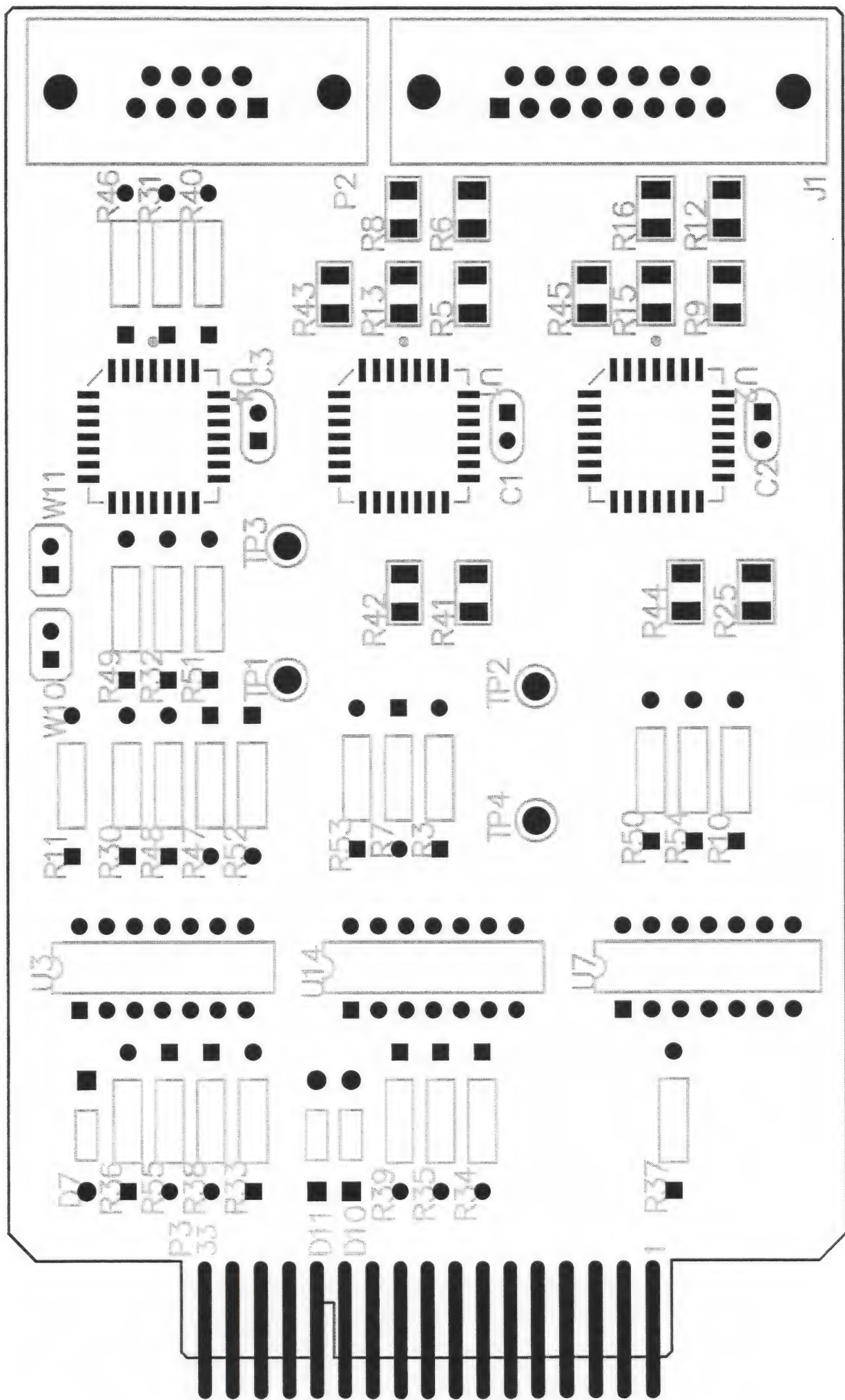
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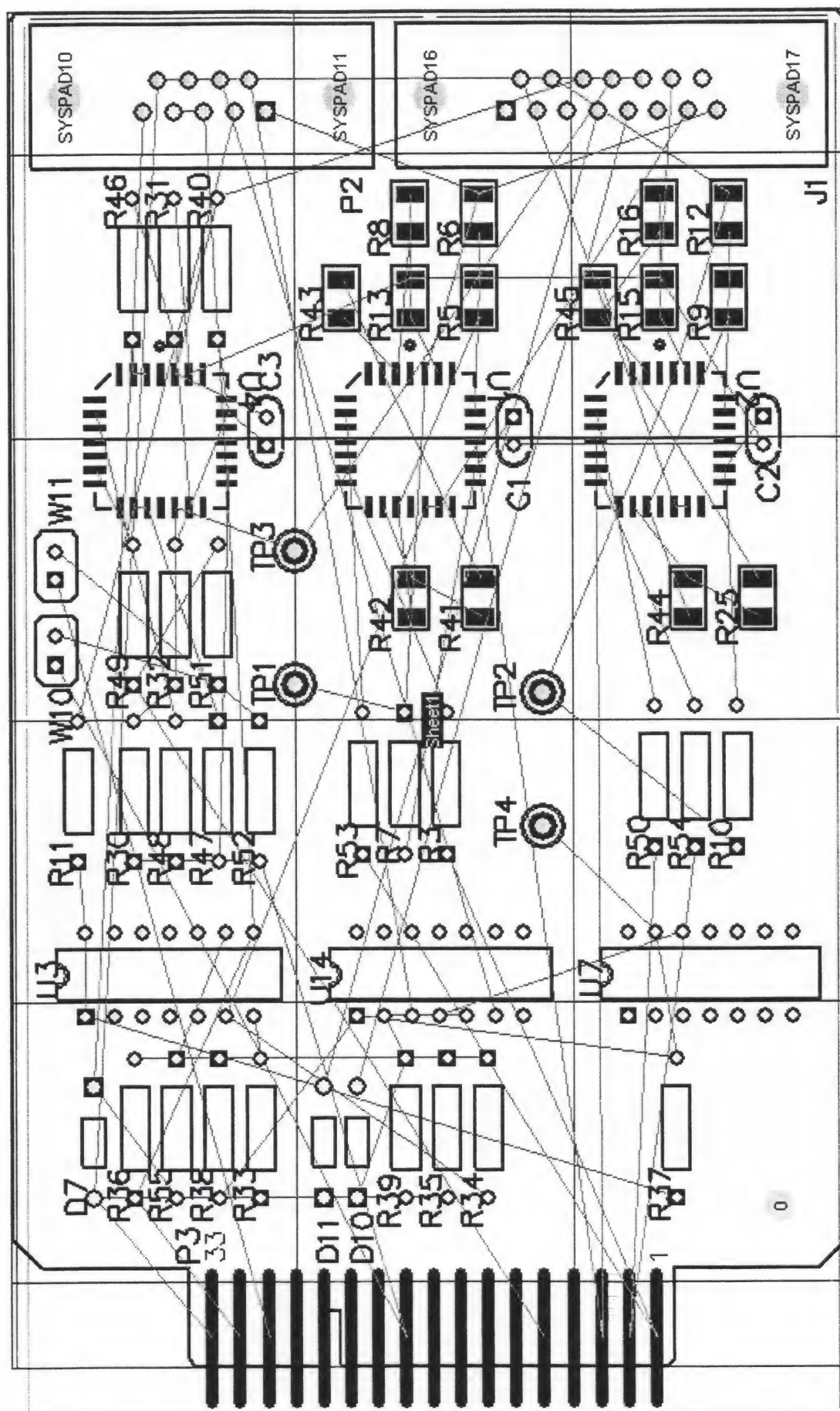
Comment	Pattern	Quantity	Components
.1uF	CAP200	19	C1, C3, C4, C6, C7, C8, C9 C10, C11, C12, C13, C14, C15 C16, C17, C18, C19, C22, C23
.1uF Film	CC1206	2	C2, C5
10K	RES500	2	R7, RN1
121	RES500	2	R1, R2
12V	RES600	4	Z1, Z2, Z3, Z4
22 uF	CAP100RP	4	C20, C21, C24, C25
32 MHZ	DIP8	1	Y1
36V	RES600	2	Z5, Z6
485 TRANSCEIVER	DIP8	2	U6, U9
511	RES500	4	R3, R4, R5, R6
74OL6000	DIP6	4	U5, U7, U10, U11
74OL6001	DIP6	1	U8
DB9F	DB9F	1	J1
JMP_3PIN	JMP3	1	W1
JMP2	JMP2	1	JP2
JUMPER	JUMPER	1	JP3
MAX232	DIP16	1	U12
PSD402A1	PLCCSOCKET68	1	U2
RS-232	DB9F	1	J3
RS-485	DB9F	1	J2
STATIC RAM	DIP28N	2	U1, U3
SWITCH8DIP	SW8POSRA	1	SW1
TN80C186EB	PLCCSOCKET84	1	U4



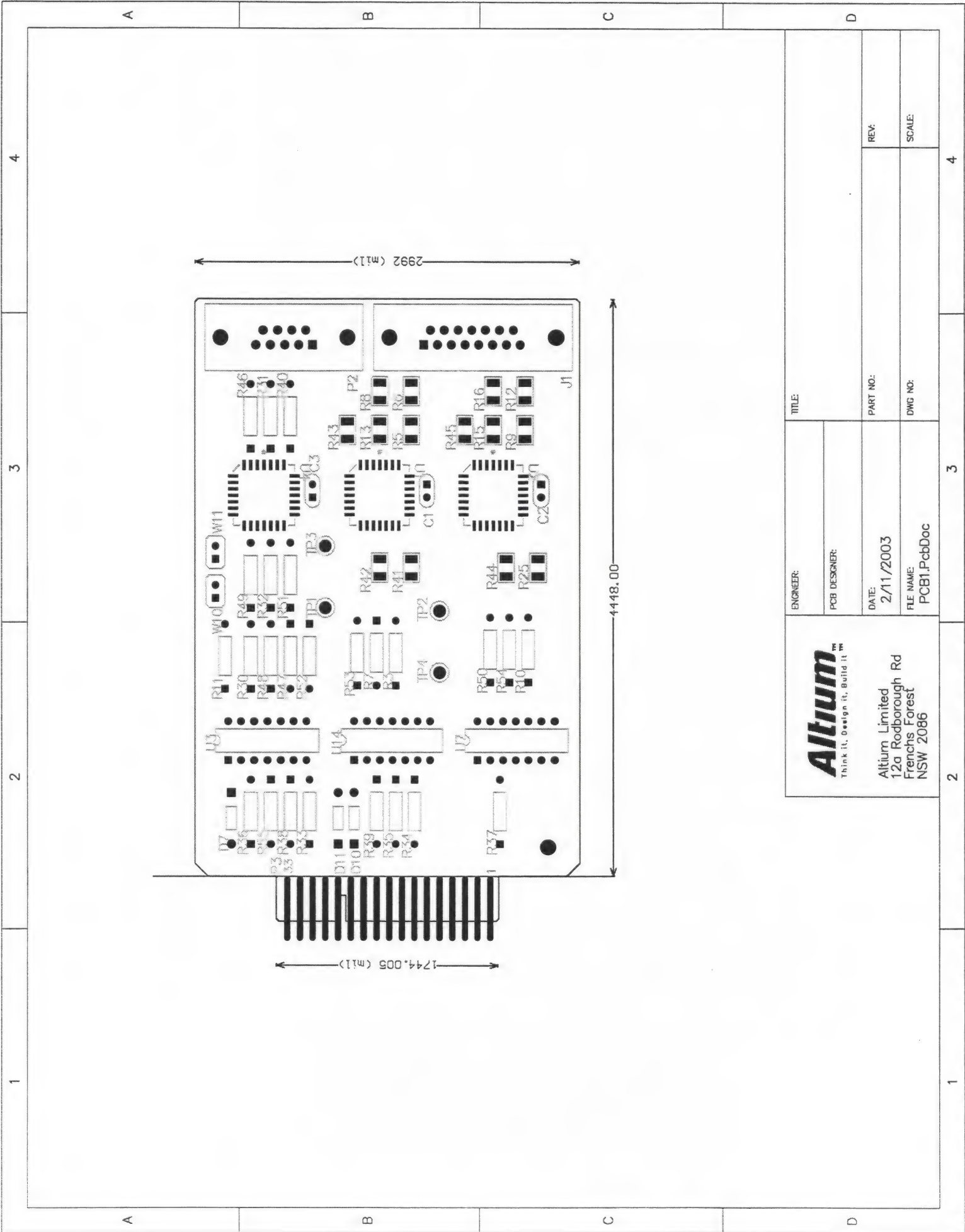






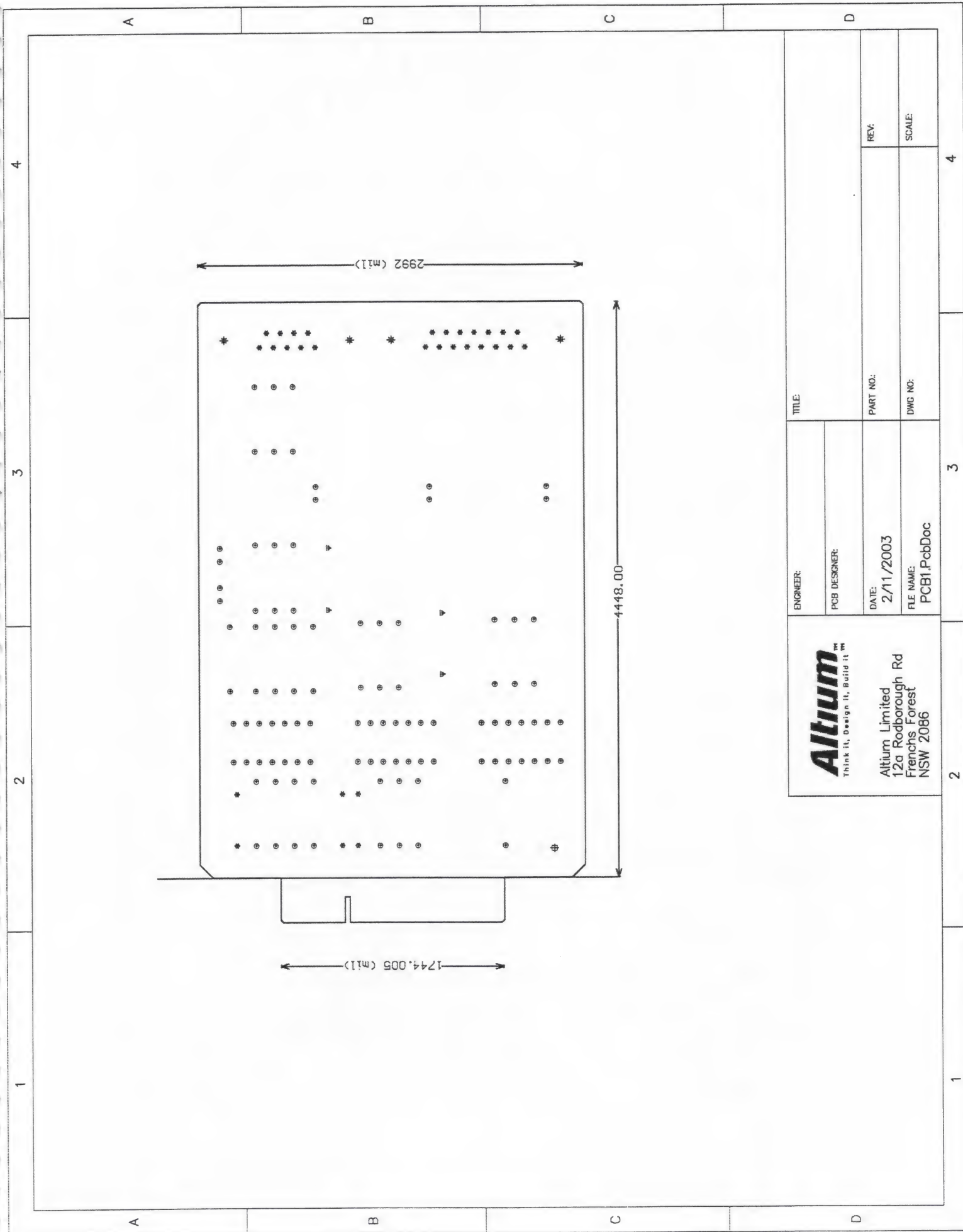






ENGINEER:		TITLE:	
PCB DESIGNER:		PART NO:	
DATE:		REV:	
2/11/2003		SCALE:	
FILE NAME:		DWG NO:	
PCB1.PcbDoc			



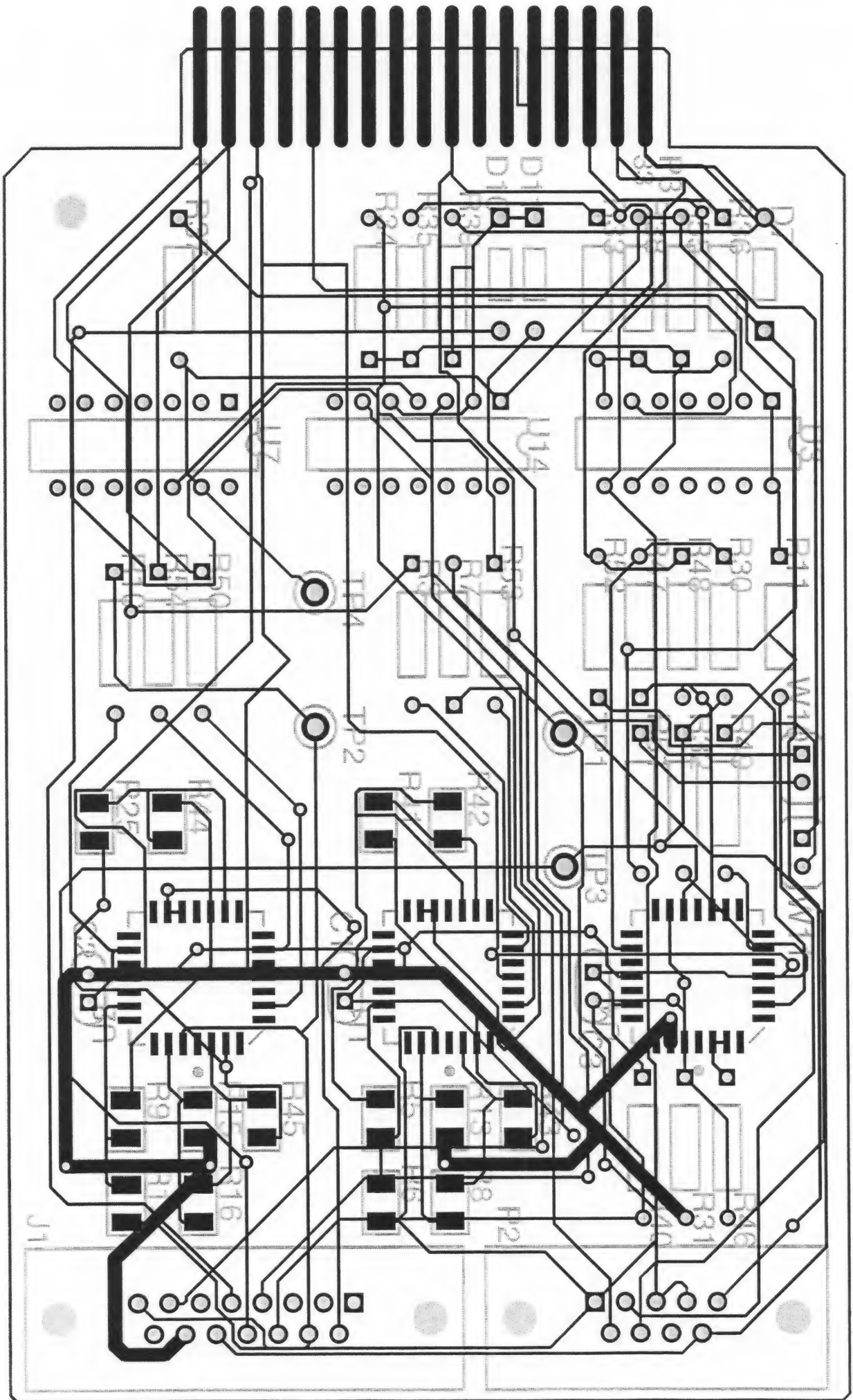


**Altium**  
Think It, Design It, Build It

Altium Limited  
12a Rodborough Rd  
Frenchs Forest  
NSW 2086

ENGINEER:	TITLE:
PCB DESIGNER:	
DATE: 2/11/2003	PART NO:
FILE NAME: PCB1.PcbDoc	DWG NO:

REV:	SCALE:



Specifications For Train1.pcb

On 2/11/2003 at 10:34:51 AM

Size Of board 11.506 x 8.006 sq in  
 Equivalent 14 pin components 4.51 sq in/14 pin component  
 Components on board 60

Layer	Route	Pads	Tracks	Fills	Arcs	Text
Top Layer		129	422	0	0	0
Bottom Layer		17	233	0	0	0
Mechanical 1		0	0	0	0	1
Mechanical 16		0	6760	0	0	316
Top Overlay		0	234	0	16	122
Keep-Out Layer		0	18	0	0	0
Multi-Layer		141	0	0	0	0
Total		287	7667	0	16	439

Layer Pair	Vias
Top Layer - Bottom Layer	33
Total	33

Non-Plated Hole Size	Pads	Vias
Total	0	0

Plated Hole Size	Pads	Vias
0mil (0mm)	146	0
28mil (0.7112mm)	0	33
38mil (0.9652mm)	102	0
46mil (1.1684mm)	30	0
62mil (1.5748mm)	4	0
120mil (3.048mm)	1	0
124mil (3.1496mm)	4	0
Total	287	33

Top Layer Annular Ring Size	Count
0mil (0mm)	5
22mil (0.5588mm)	135
24mil (0.6096mm)	30
38mil (0.9652mm)	4
Total	174

Mid Layer Annular Ring Size	Count
0mil (0mm)	5
22mil (0.5588mm)	135
24mil (0.6096mm)	30
38mil (0.9652mm)	4

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Total	174
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Bottom Layer Annular Ring Size	Count
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0mil (0mm)	5
22mil (0.5588mm)	135
24mil (0.6096mm)	30
38mil (0.9652mm)	4

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Total	174
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Pad Solder Mask	Count
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---

4mil (0.1016mm)	287
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Total	287
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---

Pad Paste Mask	Count
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---

0mil (0mm)	287
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---

Total	287
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Pad Pwr/Gnd Expansion	Count
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20mil (0.508mm)	287
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---

Total	287
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Pad Relief Conductor Width	Count
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10mil (0.254mm)	287
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---

Total	287
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---

---

Pad Relief Air Gap	Count
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---

10mil (0.254mm)	287
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---

Total	287
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Pad Relief Entries	Count
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4	287
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Total	287
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Via Solder Mask	Count
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4mil (0.1016mm)	33
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Total	33
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## Via Pwr/Gnd Expansion Count

20mil (0.508mm)	33
Total	33

## Track Width Count

1mil (0.0254mm)	6624
5mil (0.127mm)	136
10mil (0.254mm)	884
50mil (1.27mm)	23
Total	7667

## Arc Line Width Count

10mil (0.254mm)	13
20mil (0.508mm)	3
Total	16

## Arc Radius Count

10mil (0.254mm)	3
40mil (1.016mm)	3
60mil (1.524mm)	6
75mil (1.905mm)	4
Total	16

## Arc Degrees Count

180	9
360	7
Total	16

## Text Height Count

35mil (0.889mm)	192
45mil (1.143mm)	36
60mil (1.524mm)	19
64mil (1.6256mm)	2
70mil (1.778mm)	88
72.8mil (1.8491mm)	60
80mil (2.032mm)	42
Total	439

## Text Width Count

5mil (0.127mm)	228
7mil (0.1778mm)	88
8mil (0.2032mm)	2

10mil (0.254mm)	121
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Total	439
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Net Track Width	Count
-----------------	-------

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10mil (0.254mm)	57
-----------------	----

50mil (1.27mm)	1
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Total	58
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Net Via Size	Count
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50mil (1.27mm)	58
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Total	58
-------	----

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#### Routing Information

Routing completion	: 100.00%
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Connections	: 128
-------------	-------

Connections routed	: 128
--------------------	-------

Connections remaining	: 0
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PCB Library : Train1.PcbLib

Date : 2/11/2003

Time : 1:30:02 PM

Component Count : 11

Component Name

---

CAP100

DB9M

DB15F

DIP14

DO-41

EDGE34/100

JMPR100

PLCC28A

RC1210

RES500

TESTPOINT

Bill of Material for Train1.pcb

On 2/11/2003 at 10:41:11 AM

Comment	Pattern	Quantity	Components
	DB15F	15	J1, P2, P3, TP1, TP2, TP3 TP4, U1, U2, U3, U4, U7, U14 W10, W11
1.0	CAP100	3	C1, C2, C3
10.0K	RES500	12	R7, R10, R11, R34, R36, R37 R39, R40, R42, R43, R44, R45
100	RES500	7	R3, R33, R48, R49, R50, R53 R54
1K	RES500	2	R51, R52
1N5819	DO-41	3	D7, D10, D11
2.2M	RES500	2	R38, R55
20.00K	RES500	1	R32
200K	RES500	1	R35
4.99K	RES500	4	R30, R31, R46, R47
5.00K	RC1210	10	R5, R6, R8, R9, R12, R13, R15 R16, R25, R41



Specifications For Train1.pcb

On 2/13/2003 at 11:30:26 AM

Size Of board 4.985 x 3.01 sq in  
 Equivalent 14 pin components 0.00 sq in/14 pin component  
 Components on board 0

Layer	Route	Pads	Tracks	Fills	Arcs	Text
-----						
Total		0	0	0	0	0

Layer Pair	Vias
-----	
Total	0

Non-Plated Hole Size	Pads	Vias
-----		
Total	0	0

Plated Hole Size	Pads	Vias
-----		
0mil (0mm)	0	0
38mil (0.9652mm)	0	0
46mil (1.1684mm)	0	0
62mil (1.5748mm)	0	0
120mil (3.048mm)	0	0
124mil (3.1496mm)	0	0
-----		
Total	0	0

## Routing Information

-----	
Routing completion	: 0.00%
Connections	: 128
Connections routed	: 0
Connections remaining	: 128
-----	

Nets report For

On 2/11/2003 at 10:41:42 AM

+15V Signal Layers Only Length:7865 mils

-15V Signal Layers Only Length:5808 mils

ANA-COM Signal Layers Only Length:6225 mils

GND Signal Layers Only Length:8859 mils

GNDA Signal Layers Only Length:5958 mils

NetC1\_A Signal Layers Only Length:3504 mils

NetC2\_A Signal Layers Only Length:1251 mils

NetC3\_A Signal Layers Only Length:1905 mils

NetC3\_B Signal Layers Only Length:2903 mils

NetD10\_A Signal Layers Only Length:5411 mils

NetD10\_K Signal Layers Only Length:1554 mils

NetD11\_A Signal Layers Only Length:4627 mils

NetD7\_K Signal Layers Only Length:7476 mils

NetJ1\_10 Signal Layers Only Length:4773 mils

NetJ1\_12 Signal Layers Only Length:5241 mils

NetJ1\_7 Signal Layers Only Length:7939 mils

NetJ1\_8 Signal Layers Only Length:6346 mils

NetJ1\_9 Signal Layers Only Length:2364 mils

NetP2\_2 Signal Layers Only Length:2798 mils

NetP2\_6 Signal Layers Only Length:3593 mils

NetP2\_7 Signal Layers Only Length:4475 mils

NetP3\_1 Signal Layers Only Length:3055 mils

NetP3\_10 Signal Layers Only Length:5436 mils

NetP3\_19 Signal Layers Only Length:3367 mils

NetP3\_2 Signal Layers Only Length:4499 mils

NetP3\_20 Signal Layers Only Length:2866 mils

NetP3\_3 Signal Layers Only Length:1854 mils

NetP3\_30 Signal Layers Only Length:3295 mils

NetP3\_4 Signal Layers Only Length:2198 mils

NetR11\_A Signal Layers Only Length:3061 mils

NetR15_A	Signal Layers Only	Length:772 mils
NetR16_A	Signal Layers Only	Length:729 mils
NetR25_A	Signal Layers Only	Length:1809 mils
NetR25_B	Signal Layers Only	Length:1124 mils
NetR30_A	Signal Layers Only	Length:1835 mils
NetR31_A	Signal Layers Only	Length:1181 mils
NetR33_B	Signal Layers Only	Length:648 mils
NetR34_A	Signal Layers Only	Length:1685 mils
NetR3_B	Signal Layers Only	Length:1109 mils
NetR41_A	Signal Layers Only	Length:1486 mils
NetR41_B	Signal Layers Only	Length:649 mils
NetR46_A	Signal Layers Only	Length:196 mils
NetR47_A	Signal Layers Only	Length:1073 mils
NetR48_B	Signal Layers Only	Length:1613 mils
NetR49_B	Signal Layers Only	Length:374 mils
NetR50_B	Signal Layers Only	Length:1286 mils
NetR51_A	Signal Layers Only	Length:672 mils
NetR52_A	Signal Layers Only	Length:1413 mils
NetR53_B	Signal Layers Only	Length:1181 mils
NetR54_B	Signal Layers Only	Length:1105 mils
NetR5_A	Signal Layers Only	Length:2255 mils
NetR5_B	Signal Layers Only	Length:788 mils
NetR8_A	Signal Layers Only	Length:751 mils
NetR8_B	Signal Layers Only	Length:819 mils
NetR9_A	Signal Layers Only	Length:1307 mils
NetR9_B	Signal Layers Only	Length:836 mils
NetU7_12	Signal Layers Only	Length:1053 mils
VCC	Signal Layers Only	Length:716 mils

## Test Point Report

Net	Name	X Coord	Y Coord	Side	Hole Size	Type
NetR52_A	W11-2	8400mil	7270mil	Top	38mil	Through hole
NetJ1_12	R30-2	7800mil	6995mil	Top	38mil	Through hole
NetJ1_8	TP1-1	7925mil	6420mil	Top	62mil	Through hole
NetJ1_10	TP2-1	7900mil	5520mil	Top	62mil	Through hole
NetJ1_12	TP3-1	8400mil	6420mil	Top	62mil	Through hole
NetD7_K	TP4-1	7425mil	5520mil	Top	62mil	Through hole
NetR52_A	W11-2	8400mil	7270mil	Bottom	38mil	Through hole
NetJ1_12	R30-2	7800mil	6995mil	Bottom	38mil	Through hole
NetJ1_8	TP1-1	7925mil	6420mil	Bottom	62mil	Through hole
NetJ1_10	TP2-1	7900mil	5520mil	Bottom	62mil	Through hole
NetJ1_12	TP3-1	8400mil	6420mil	Bottom	62mil	Through hole
NetD7_K	TP4-1	7425mil	5520mil	Bottom	62mil	Through hole



## Pick and Place Report

Designator	Footprint	Mid X	Mid Y	Ref X	Ref Y	Pad X
P3	EDGE34/100	5600mil	5920mil	5600mil	5120mil	5600mil
R31	RES500	9400mil	6845mil	9150mil	6845mil	9150mil
R32	RES500	8175mil	6845mil	7925mil	6845mil	7925mil
W11	JMPR100	8350mil	7270mil	8300mil	7270mil	8300mil
R41	RC1210	8233mil	5745mil	8300mil	5745mil	8300mil
R42	RC1210	8233mil	5995mil	8300mil	5995mil	8300mil
R8	RC1210	9592mil	5995mil	9525mil	5995mil	9525mil
R6	RC1210	9592mil	5745mil	9525mil	5745mil	9525mil
D11	DO-41	6300mil	6320mil	6100mil	6320mil	6500mil
R25	RC1210	8233mil	4745mil	8300mil	4745mil	8300mil
R44	RC1210	8233mil	4995mil	8300mil	4995mil	8300mil
R16	RC1210	9592mil	5095mil	9525mil	5095mil	9525mil
R12	RC1210	9592mil	4845mil	9525mil	4845mil	9525mil
R46	RES500	9400mil	6995mil	9150mil	6995mil	9150mil
R49	RES500	8175mil	6995mil	7925mil	6995mil	7925mil
R51	RES500	8175mil	6695mil	7925mil	6695mil	7925mil
R40	RES500	9400mil	6695mil	9150mil	6695mil	9150mil
D10	DO-41	6300mil	6195mil	6100mil	6195mil	6500mil
J1	DB15F	10006mil	5263.5mil	9950mil	5645mil	9950mil
P2	DB9M	10006mil	6738mil	9950mil	6520mil	9950mil
U4	PLCC28A	8790mil	6895mil	9025mil	6895mil	9025mil
TP2	TESTPOINT	7900mil	5520mil	7900mil	5520mil	7900mil
U3	DIP14	6900mil	6870mil	6750mil	7170mil	6750mil
U14	DIP14	6900mil	5895mil	6750mil	6195mil	6750mil
R43	RC1210	9292mil	6245mil	9225mil	6245mil	9225mil
R13	RC1210	9292mil	5995mil	9225mil	5995mil	9225mil
R5	RC1210	9292mil	5745mil	9225mil	5745mil	9225mil
U1	PLCC28A	8790mil	5995mil	9025mil	5995mil	9025mil
R45	RC1210	9292mil	5320mil	9225mil	5320mil	9225mil
R15	RC1210	9292mil	5095mil	9225mil	5095mil	9225mil
U2	PLCC28A	8790mil	5095mil	9025mil	5095mil	9025mil
R9	RC1210	9292mil	4845mil	9225mil	4845mil	9225mil
W10	JMPR100	8050mil	7270mil	8000mil	7270mil	8000mil
R11	RES500	7550mil	7195mil	7300mil	7195mil	7300mil
R48	RES500	7550mil	6845mil	7300mil	6845mil	7300mil
R52	RES500	7550mil	6545mil	7800mil	6545mil	7800mil
R7	RES500	7575mil	6020mil	7825mil	6020mil	7825mil
R50	RES500	7600mil	5120mil	7350mil	5120mil	7350mil
R10	RES500	7600mil	4820mil	7350mil	4820mil	7350mil
R55	RES500	6350mil	6845mil	6600mil	6845mil	6600mil
D7	DO-41	6300mil	7145mil	6500mil	7145mil	6100mil
R34	RES500	6350mil	5720mil	6600mil	5720mil	6600mil
R33	RES500	6350mil	6545mil	6100mil	6545mil	6100mil
R39	RES500	6350mil	6020mil	6600mil	6020mil	6600mil
R37	RES500	6350mil	5045mil	6100mil	5045mil	6100mil
U7	DIP14	6900mil	4920mil	6750mil	5220mil	6750mil
C3	CAP100	8825mil	6520mil	8775mil	6520mil	8775mil
C1	CAP100	8825mil	5620mil	8875mil	5620mil	8875mil
C2	CAP100	8825mil	4720mil	8875mil	4720mil	8875mil
R30	RES500	7550mil	6995mil	7300mil	6995mil	7300mil
R47	RES500	7550mil	6695mil	7800mil	6695mil	7800mil
TP1	TESTPOINT	7925mil	6420mil	7925mil	6420mil	7925mil
R53	RES500	7575mil	6170mil	7325mil	6170mil	7325mil
R3	RES500	7575mil	5870mil	7325mil	5870mil	7325mil
R54	RES500	7600mil	4970mil	7350mil	4970mil	7350mil
R36	RES500	6350mil	6995mil	6100mil	6995mil	6100mil
R38	RES500	6350mil	6695mil	6600mil	6695mil	6600mil
R35	RES500	6350mil	5870mil	6600mil	5870mil	6600mil

P4	TESTPOINT	7425mil	5520mil	7425mil	5520mil	7425mil
P3	TESTPOINT	8400mil	6420mil	8400mil	6420mil	8400mil

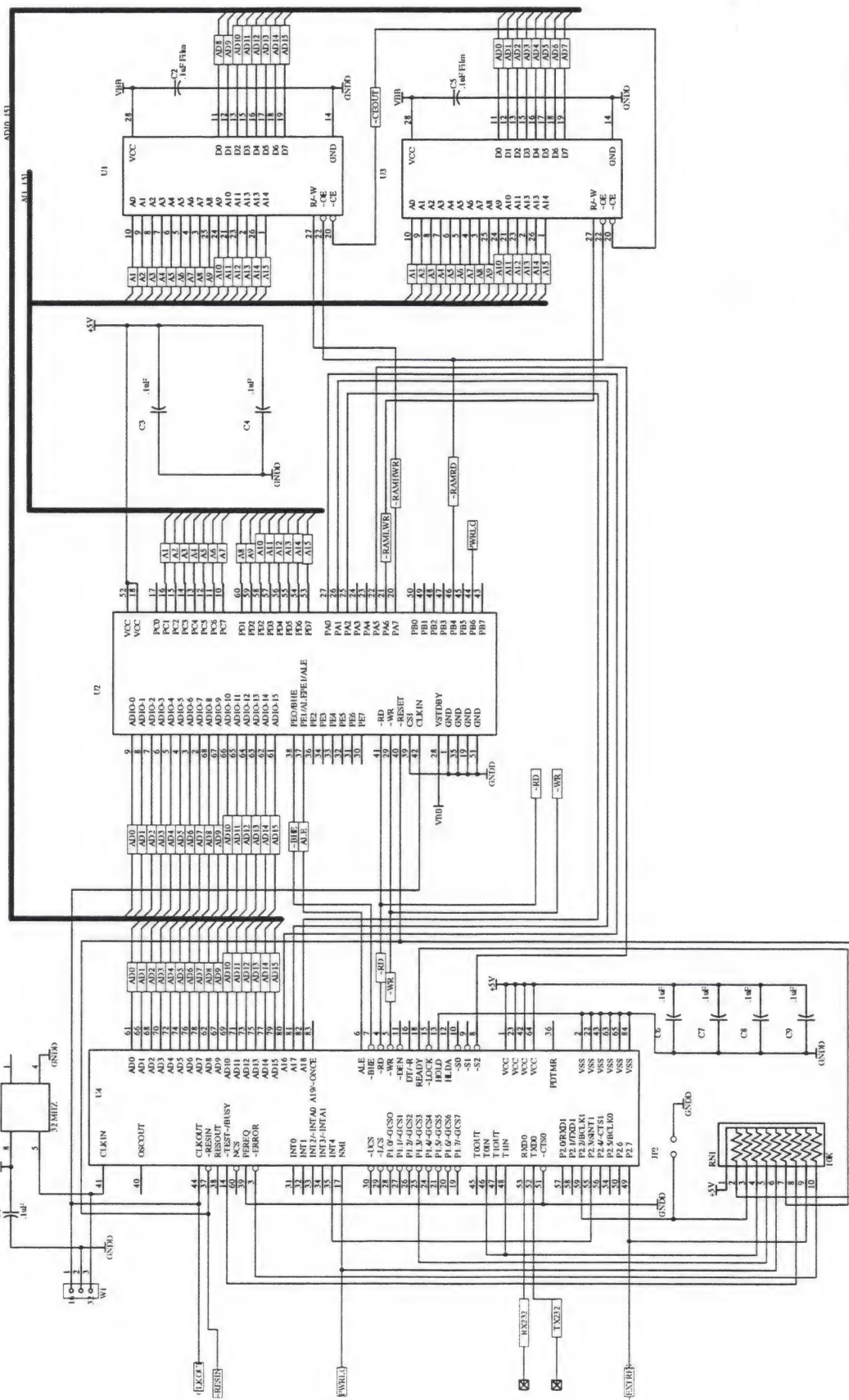


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Drawn by				

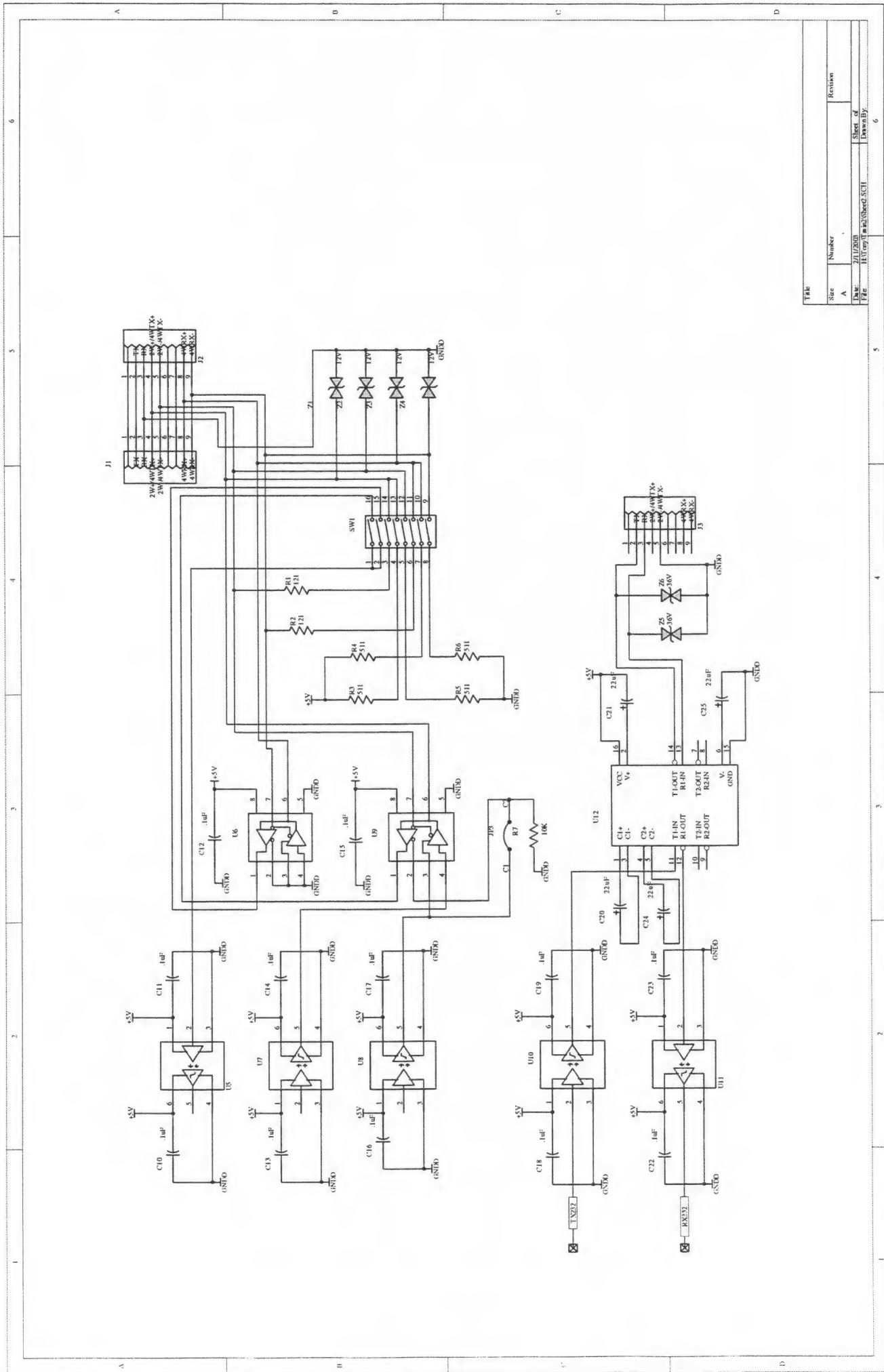


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File	HUY093.mxd	Sheet 2	5/11



Report Generated From DXP

Description	Designator	Footprint	LibRef	Quantity
	C1, C2, C3, C4, C5, C6, C7, C8, C9, JP2, RN CAP200, CC1206, DIP8, DIP28N, JMP2, JMF CAP200, CC1206, JMP2, JMP_3PIN, OSC_£ 17			
	C10, C11, C12, C13, C14, C15, C16, C17, C- CAP100RP, CAP200, DB9F, DIP6, DIP8, DIF 74OL6000, 74OL6001, 485 TRANSCIVER, 42			

Simple Bill of Material for Train2.PrjPcb

On 2/11/2003 at 11:25:34 AM

Comment	Pattern	Quantity	Components
.1uF	CAP200	19	C1, C3, C4, C6, C7, C8, C9 C10, C11, C12, C13, C14, C15 C16, C17, C18, C19, C22, C23
.1uF Film	CC1206	2	C2, C5
10K	RES500	2	R7, RN1
121	RES500	2	R1, R2
12V	RES600	4	Z1, Z2, Z3, Z4
22 uF	CAP100RP	4	C20, C21, C24, C25
32 MHZ	DIP8	1	Y1
36V	RES600	2	Z5, Z6
485 TRANSCEIVER	DIP8	2	U6, U9
511	RES500	4	R3, R4, R5, R6
74OL6000	DIP6	4	U5, U7, U10, U11
74OL6001	DIP6	1	U8
DB9F	DB9F	1	J1
JMP_3PIN	JMP3	1	W1
JMP2	JMP2	1	JP2
JUMPER	JUMPER	1	JP3
MAX232	DIP16	1	U12
PSD402A1	PLCCSOCKET68	1	U2
RS-232	DB9F	1	J3
RS-485	DB9F	1	J2
STATIC RAM	DIP28N	2	U1, U3
SWITCH8DIP	SW8POSRA	1	SW1
TN80C186EB	PLCCSOCKET84	1	U4

Report Generated From DXP

Description	Designator	Footprint	LibRef	Quantity
	C1	CAP200	CAP200	1
	C2	CC1206	CC1206	1
	C3	CC1206	CC1206	1
	C4	CC1206	CC1206	1
	C5	CC1206	CC1206	1
	C6	CC1206	CC1206	1
	C7	CC1206	CC1206	1
	C8	CC1206	CC1206	1
	C9	CAP200	CAP200	1
	C10	CAP200	CAP200	1
	C11	CAP200	CAP200	1
	C12	CAP200	CAP200	1
	C13	CAP200	CAP200	1
	C14	CAP200	CAP200	1
	C15	CAP200	CAP200	1
	C16	CAP200	CAP200	1
	C17	CAP200	CAP200	1
	C18	CAP200	CAP200	1
	C19	CAP200	CAP200	1
	C20	CAP100RP	CAP100RP	1
	C21	CAP100RP	CAP100RP	1
	C22	CAP200	CAP200	1
	C23	CAP200	CAP200	1
	C24	CAP100RP	CAP100RP	1
	C25	CAP100RP	CAP100RP	1
	J1	DB9F	DB9F	1
	J2	DB9F	DB9F	1
	J3	DB9F	DB9F	1
	JP2	JMP2	JMP2	1
	JP3	JUMPER	JUMPER	1
	R1	RES500	RES500	1
	R2	RES500	RES500	1
	R3	RES500	RES500	1
	R4	RES500	RES500	1
	R5	RES500	RES500	1
	R6	RES500	RES500	1
	R7	RES500	RES500	1
	RN1	SIP10	RES10SIPB	1
	SW1	SW8POSRA	SWITCH8DIP	1
	U1	DIP28N	STATIC RAM	1
	U2	PLCCSOCKET68	PSD402A1	1
	U3	DIP28N	STATIC RAM	1
	U4	PLCCSOCKET84	TN80C186EB	1
	U5	DIP6	74OL6000	1
	U6	DIP8	485 TRANSCEIVER	1
	U7	DIP6	74OL6000	1
	U8	DIP6	74OL6001	1
	U9	DIP8	485 TRANSCEIVER	1

Description	Designator	Footprint	LibRef	Quantity
	U9	DIP8	485 TRANSCIVER	1
	U10	DIP6	74OL6000	1
	U11	DIP6	74OL6000	1
	U12	DIP16	MAX232	1
	W1	JMP3	JMP_3PIN	1
	Y1	DIP8	OSC_8PIN	1
	Z1	RES600	TRANSORB	1
	Z2	RES600	TRANSORB	1
	Z3	RES600	TRANSORB	1
	Z4	RES600	TRANSORB	1
	Z5	RES600	TRANSORB	1
	Z6	RES600	TRANSORB	1



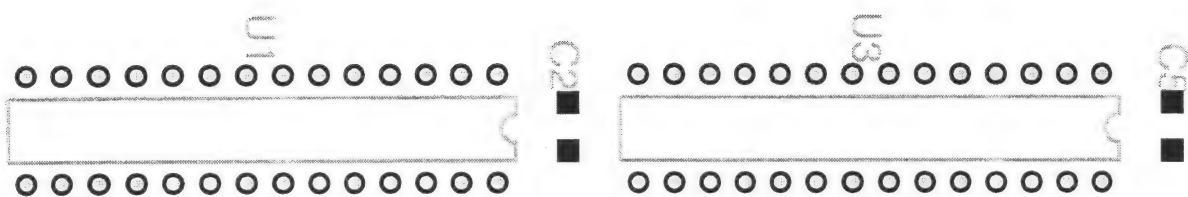
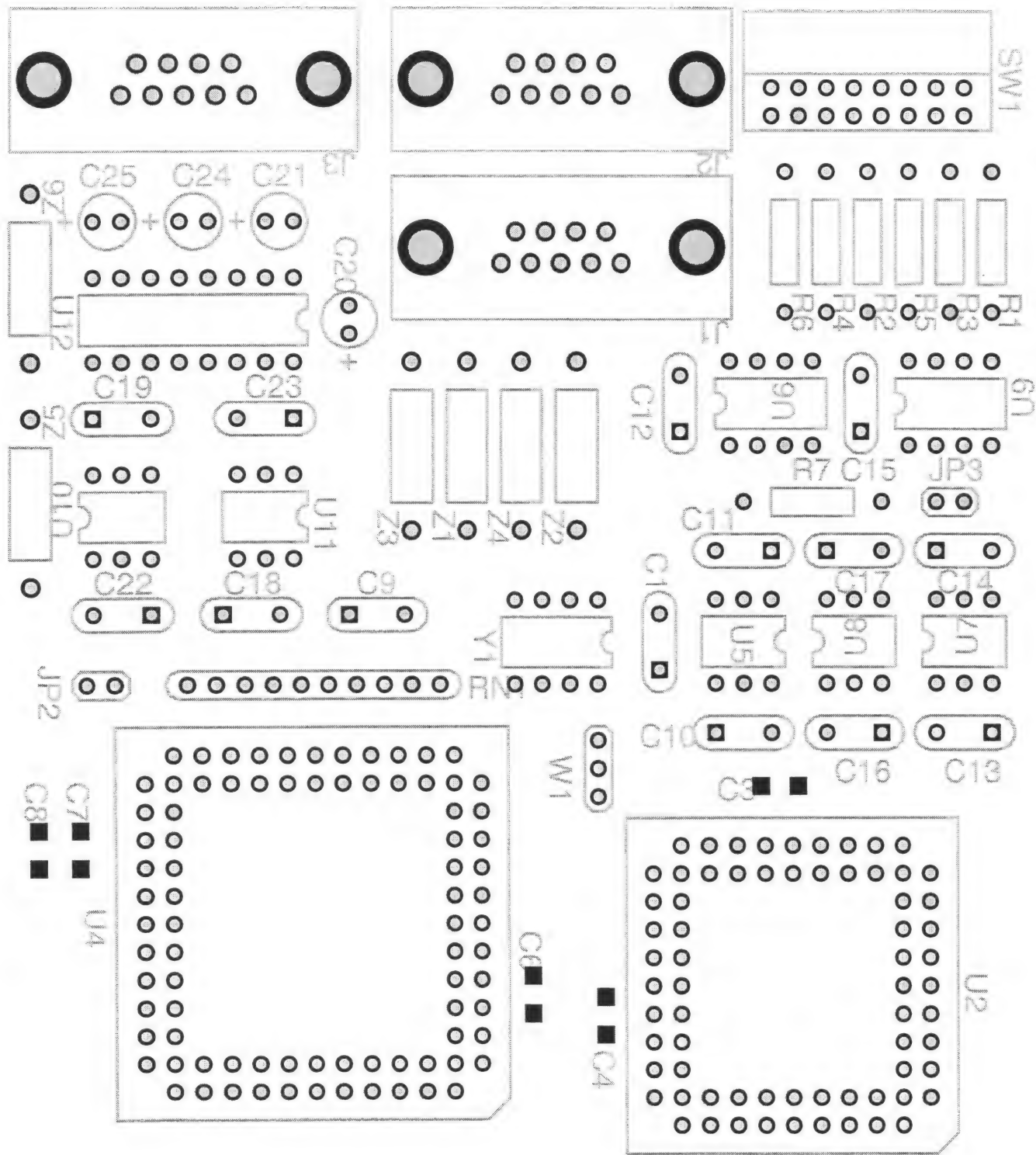
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Designator	Footprint	LibRef	Quantity
C1	CAP200	CAP200	1
C2	CC1206	CC1206	1
C3	CC1206	CC1206	1
C4	CC1206	CC1206	1
C5	CC1206	CC1206	1
C6	CC1206	CC1206	1
C7	CC1206	CC1206	1
C8	CC1206	CC1206	1
C9	CAP200	CAP200	1
C10	CAP200	CAP200	1
C11	CAP200	CAP200	1
C12	CAP200	CAP200	1
C13	CAP200	CAP200	1
C14	CAP200	CAP200	1
C15	CAP200	CAP200	1
C16	CAP200	CAP200	1
C17	CAP200	CAP200	1
C18	CAP200	CAP200	1
C19	CAP200	CAP200	1
C20	CAP100RP	CAP100RP	1
C21	CAP100RP	CAP100RP	1
C22	CAP200	CAP200	1
C23	CAP200	CAP200	1
C24	CAP100RP	CAP100RP	1
C25	CAP100RP	CAP100RP	1
J1	DB9F	DB9F	1
J2	DB9F	DB9F	1
J3	DB9F	DB9F	1
JP2	JMP2	JMP2	1
JP3	JUMPER	JUMPER	1
R1	RES500	RES500	1
R2	RES500	RES500	1
R3	RES500	RES500	1
R4	RES500	RES500	1
R5	RES500	RES500	1
R6	RES500	RES500	1
R7	RES500	RES500	1
RN1	SIP10	RES10SIPB	1
SW1	SW8POSRA	SWITCH8DIP	1
U1	DIP28N	STATIC RAM	1
U2	PLCCSOCKET68	PSD402A1	1
U3	DIP28N	STATIC RAM	1
U4	PLCCSOCKET84	TN80C186EB	1
U5	DIP6	74OL6000	1
U6	DIP8	485 TRANSCEIVER	1
U7	DIP6	74OL6000	1
U8	DIP6	74OL6001	1

U9	DIP8	485 TRANSCEIVER	1
U10	DIP6	74OL6000	1
U11	DIP6	74OL6000	1
U12	DIP16	MAX232	1
W1	JMP3	JMP_3PIN	1
Y1	DIP8	OSC_8PIN	1
Z1	RES600	TRANSORB	1
Z2	RES600	TRANSORB	1
Z3	RES600	TRANSORB	1
Z4	RES600	TRANSORB	1
Z5	RES600	TRANSORB	1
Z6	RES600	TRANSORB	1

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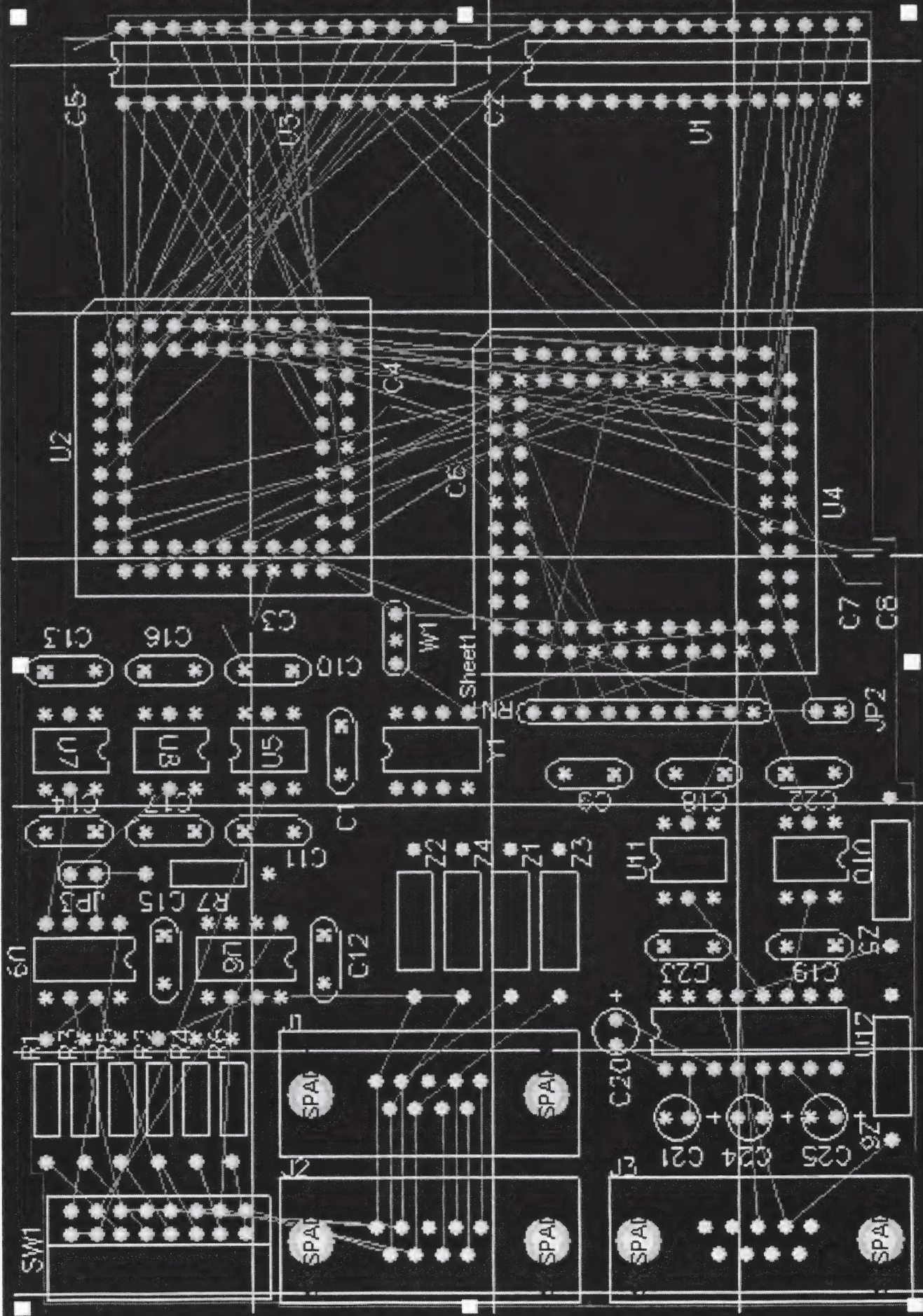
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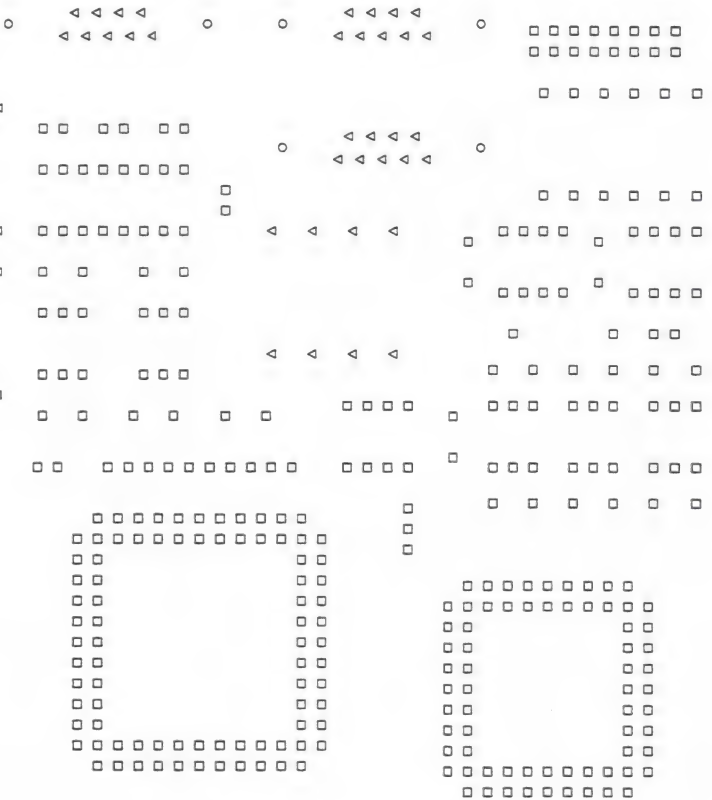
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A

B

C

D



A

B

C

D

**Altium**  
Think It, Design It, Build It™Altium Limited  
12a Rodborough Rd  
Frenchs Forest  
NSW 2086

ENGINEER:

PCB DESIGNER:

DATE:  
2/11/2003FILE NAME:  
Apcbd.doc

TITLE:

PART NO.:

DWG NO.:

REV.:

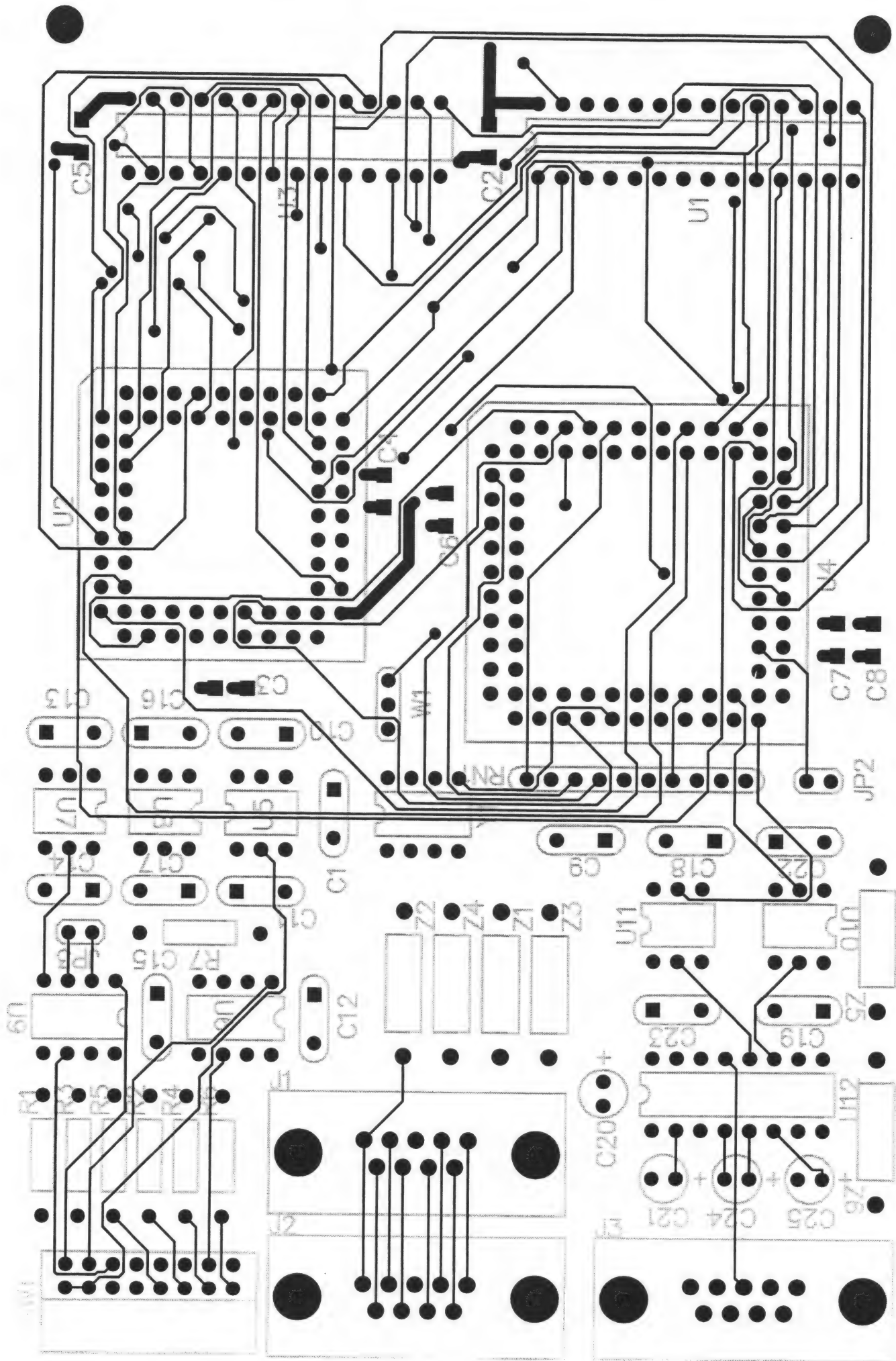
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1

2

3

4





Specifications For Train2.pcb

On 2/11/2003 at 1:09:41 PM

Size Of board 5.8 x 3.8 sq in  
 Equivalent 14 pin components 0.73 sq in/14 pin component  
 Components on board 59

Layer	Route	Pads	Tracks	Fills	Arcs	Text
Top Layer		14	498	0	0	0
Internal Plane 2		0	4	0	4	0
Internal Plane 1		0	4	0	4	0
Bottom Layer		0	499	0	0	0
Top Overlay		0	198	0	45	118
Keep-Out Layer		0	4	0	0	0
Multi-Layer		408	0	0	0	0
Total		422	1207	0	53	118

Layer Pair	Vias
Top Layer - Bottom Layer	51
Total	51

Non-Plated Hole Size	Pads	Vias
Total	0	0

Plated Hole Size	Pads	Vias
0mil (0mm)	14	0
28mil (0.7112mm)	0	51
38mil (0.9652mm)	361	0
46mil (1.1684mm)	39	0
124mil (3.1496mm)	6	0
156mil (3.9624mm)	2	0
Total	422	51

Top Layer Annular Ring Size	Count
0mil (0mm)	2
22mil (0.5588mm)	412
24mil (0.6096mm)	39
76mil (1.9304mm)	6
Total	459

Mid Layer Annular Ring Size	Count
0mil (0mm)	2
22mil (0.5588mm)	412
24mil (0.6096mm)	39
76mil (1.9304mm)	6

Total	459
-------	-----

Bottom Layer Annular Ring Size	Count
--------------------------------	-------

0mil (0mm)	2
22mil (0.5588mm)	412
24mil (0.6096mm)	39
76mil (1.9304mm)	6

Total	459
-------	-----

Pad Solder Mask	Count
-----------------	-------

4mil (0.1016mm)	422
-----------------	-----

Total	422
-------	-----

Pad Paste Mask	Count
----------------	-------

0mil (0mm)	422
------------	-----

Total	422
-------	-----

Pad Pwr/Gnd Expansion	Count
-----------------------	-------

20mil (0.508mm)	422
-----------------	-----

Total	422
-------	-----

Pad Relief Conductor Width	Count
----------------------------	-------

10mil (0.254mm)	422
-----------------	-----

Total	422
-------	-----

Pad Relief Air Gap	Count
--------------------	-------

10mil (0.254mm)	422
-----------------	-----

Total	422
-------	-----

Pad Relief Entries	Count
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4	422
---	-----

Total	422
-------	-----

Via Solder Mask	Count
-----------------	-------

4mil (0.1016mm)	51
-----------------	----

Total	51
-------	----



Via Pwr/Gnd Expansion	Count
-----------------------	-------

20mil (0.508mm)	51
-----------------	----

Total	51
-------	----

Track Width	Count
-------------	-------

10mil (0.254mm)	1149
-----------------	------

15mil (0.381mm)	6
-----------------	---

40mil (1.016mm)	8
-----------------	---

50mil (1.27mm)	44
----------------	----

Total	1207
-------	------

Arc Line Width	Count
----------------	-------

10mil (0.254mm)	45
-----------------	----

40mil (1.016mm)	8
-----------------	---

Total	53
-------	----

Arc Radius	Count
------------	-------

5.015mil (0.1274mm)	8
---------------------	---

40mil (1.016mm)	11
-----------------	----

50mil (1.27mm)	2
----------------	---

60mil (1.524mm)	28
-----------------	----

100mil (2.54mm)	4
-----------------	---

Total	53
-------	----

Arc Degrees	Count
-------------	-------

90	8
----	---

180	41
-----	----

360	4
-----	---

Total	53
-------	----

Text Height	Count
-------------	-------

60mil (1.524mm)	16
-----------------	----

72.8mil (1.8491mm)	59
--------------------	----

80mil (2.032mm)	43
-----------------	----

Total	118
-------	-----

Text Width	Count
------------	-------

10mil (0.254mm)	118
-----------------	-----

Total	118
-------	-----

Net Track Width	Count
-----------------	-------

---

10mil (0.254mm)	90
-----------------	----

---

Total	90
-------	----

Net Via Size	Count
--------------	-------

---

50mil (1.27mm)	90
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---

Total	90
-------	----

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Routing Information

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Routing completion : 100.00%

Connections : 260

Connections routed : 260

Connections remaining : 0

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## Library Component Report

Library Component Count : 26

Name	Description
------	-------------

+5V	
485 TRANSCEIVER	
74OL6000	
74OL6001	
CAP100RP	
CAP200	
CC1206	
DB9F	
GNDD	
JMP2	
JMP_3PIN	
JUMPER	
MAX232	
OSC_8PIN	
PLC_LOGO	
PSD402A1	
RES10SIPB	
RES500	
SHEETBUS	
SHEETIN	
SHEETOUT	
STATIC RAM	
SWITCH8DIP	
TN80C186EB	
TRANSORB	
VBB	

Simple Bill of Material for Train2.pcb

On 2/11/2003 at 1:11:43 PM

Comment	Pattern	Quantity	Components
.1uF	CAP200	19	C1, C3, C4, C6, C7, C8, C9 C10, C11, C12, C13, C14, C15 C16, C17, C18, C19, C22, C23
.1uF Film	CC1206	2	C2, C5
10K	RES500	2	R7, RN1
121	RES500	2	R1, R2
12V	RES600	4	Z1, Z2, Z3, Z4
22 uF	CAP100RP	4	C20, C21, C24, C25
32 MHZ	DIP8	1	Y1
36V	RES600	2	Z5, Z6
485 TRANSCEIVER	DIP8	2	U6, U9
511	RES500	4	R3, R4, R5, R6
74OL6000	DIP6	4	U5, U7, U10, U11
74OL6001	DIP6	1	U8
DB9F	DB9F	1	J1
JMP_3PIN	JMP3	1	W1
JMP2	JMP2	1	JP2
JUMPER	JUMPER	1	JP3
MAX232	DIP16	1	U12
PSD402A1	PLCCSOCKET68	1	U2
RS-232	DB9F	1	J3
RS-485	DB9F	1	J2
STATIC RAM	DIP28N	2	U1, U3
SWITCH8DIP	SW8POSRA	1	SW1
TN80C186EB	PLCCSOCKET84	1	U4

Report Generated From DXP

Description	Designator	Footprint	LibRef	Quantity
	C1	CAP200	CAP200	1
	C2	CC1206	CC1206	1
	C3	CC1206	CC1206	1
	C4	CC1206	CC1206	1
	C5	CC1206	CC1206	1
	C6	CC1206	CC1206	1
	C7	CC1206	CC1206	1
	C8	CC1206	CC1206	1
	C9	CAP200	CAP200	1
	C10	CAP200	CAP200	1
	C11	CAP200	CAP200	1
	C12	CAP200	CAP200	1
	C13	CAP200	CAP200	1
	C14	CAP200	CAP200	1
	C15	CAP200	CAP200	1
	C16	CAP200	CAP200	1
	C17	CAP200	CAP200	1
	C18	CAP200	CAP200	1
	C19	CAP200	CAP200	1
	C20	CAP100RP	CAP100RP	1
	C21	CAP100RP	CAP100RP	1
	C22	CAP200	CAP200	1
	C23	CAP200	CAP200	1
	C24	CAP100RP	CAP100RP	1
	C25	CAP100RP	CAP100RP	1
	J1	DB9F	DB9F	1
	J2	DB9F	DB9F	1
	J3	DB9F	DB9F	1
	JP2	JMP2	JMP2	1
	JP3	JUMPER	JUMPER	1
	R1	RESS00	RESS00	1
	R2	RESS00	RESS00	1
	R3	RESS00	RESS00	1
	R4	RESS00	RESS00	1
	R5	RESS00	RESS00	1
	R6	RESS00	RESS00	1
	R7	RESS00	RESS00	1
	RN1	SIP10	RES10SIPB	1
	SW1	SW8POSRA	SWITCH8DIP	1
	U1	DIP28N	STATIC RAM	1
	U2	PLCCSOCKET68	PSD402A1	1
	U3	DIP28N	STATIC RAM	1
	U4	PLCCSOCKET84	TN80C186EB	1
	U5	DIP6	74OL6000	1
	U6	DIP8	485 TRANSCEIVER	1
	U7	DIP6	74OL6000	1
	U8	DIP6	74OL6001	1
	U9	DIP8	485 TRANSCEIVER	1



Description	Designator	Footprint	LibRef	Quantity
	U9	DIP8	485 TRANSCEIVER	1
	U10	DIP6	74QL6000	1
	U11	DIP6	74QL6000	1
	U12	DIP16	MAX232	1
	W1	JMP3	JMP_3PIN	1
	Y1	DIP8	OSC_8PIN	1
	Z1	RES600	TRANSORB	1
	Z2	RES600	TRANSORB	1
	Z3	RES600	TRANSORB	1
	Z4	RES600	TRANSORB	1
	Z5	RES600	TRANSORB	1
	Z6	RES600	TRANSORB	1

# **Bill of Materials Report** **Microsoft Excel**

Designator	Footprint	LibRef	Quantity
C1	CAP200	CAP200	1
C2	CC1206	CC1206	1
C3	CC1206	CC1206	1
C4	CC1206	CC1206	1
C5	CC1206	CC1206	1
C6	CC1206	CC1206	1
C7	CC1206	CC1206	1
C8	CC1206	CC1206	1
C9	CAP200	CAP200	1
C10	CAP200	CAP200	1
C11	CAP200	CAP200	1
C12	CAP200	CAP200	1
C13	CAP200	CAP200	1
C14	CAP200	CAP200	1
C15	CAP200	CAP200	1
C16	CAP200	CAP200	1
C17	CAP200	CAP200	1
C18	CAP200	CAP200	1
C19	CAP200	CAP200	1
C20	CAP100RP	CAP100RP	1
C21	CAP100RP	CAP100RP	1
C22	CAP200	CAP200	1
C23	CAP200	CAP200	1
C24	CAP100RP	CAP100RP	1
C25	CAP100RP	CAP100RP	1
J1	DB9F	DB9F	1
J2	DB9F	DB9F	1
J3	DB9F	DB9F	1
JP2	JMP2	JMP2	1
JP3	JUMPER	JUMPER	1
R1	RES500	RES500	1
R2	RES500	RES500	1
R3	RES500	RES500	1
R4	RES500	RES500	1
R5	RES500	RES500	1
R6	RES500	RES500	1
R7	RES500	RES500	1
RN1	SIP10	RES10SIPB	1
SW1	SW8POSRA	SWITCH8DIP	1
U1	DIP28N	STATIC RAM	1
U2	PLCCSOCKET68	PSD402A1	1
U3	DIP28N	STATIC RAM	1
U4	PLCCSOCKET84	TN80C186EB	1
U5	DIP6	74OL6000	1
U6	DIP8	485 TRANSCEIVER	1
U7	DIP6	74OL6000	1

U8	DIP6	74OL6001	1
U9	DIP8	485 TRANSCEIVER	1
U10	DIP6	74OL6000	1
U11	DIP6	74OL6000	1
U12	DIP16	MAX232	1
W1	JMP3	JMP_3PIN	1
Y1	DIP8	OSC_8PIN	1
Z1	RES600	TRANSORB	1
Z2	RES600	TRANSORB	1
Z3	RES600	TRANSORB	1
Z4	RES600	TRANSORB	1
Z5	RES600	TRANSORB	1
Z6	RES600	TRANSORB	1

Nets report For

On 2/11/2003 at 1:15:52 PM

+5V	Signal Layers Only	Length:330 mils
A1	Signal Layers Only	Length:5284 mils
A10	Signal Layers Only	Length:3833 mils
A11	Signal Layers Only	Length:3366 mils
A12	Signal Layers Only	Length:8646 mils
A13	Signal Layers Only	Length:4466 mils
A14	Signal Layers Only	Length:6113 mils
A15	Signal Layers Only	Length:4869 mils
A2	Signal Layers Only	Length:3943 mils
A3	Signal Layers Only	Length:3382 mils
A4	Signal Layers Only	Length:4107 mils
A5	Signal Layers Only	Length:3993 mils
A6	Signal Layers Only	Length:3063 mils
A7	Signal Layers Only	Length:3934 mils
A8	Signal Layers Only	Length:3228 mils
A9	Signal Layers Only	Length:3796 mils
AD0	Signal Layers Only	Length:5999 mils
AD1	Signal Layers Only	Length:5738 mils
AD10	Signal Layers Only	Length:4811 mils
AD11	Signal Layers Only	Length:5356 mils
AD12	Signal Layers Only	Length:3983 mils
AD13	Signal Layers Only	Length:5297 mils
AD14	Signal Layers Only	Length:3184 mils
AD15	Signal Layers Only	Length:3689 mils
AD2	Signal Layers Only	Length:6238 mils
AD3	Signal Layers Only	Length:6543 mils
AD4	Signal Layers Only	Length:5229 mils
AD5	Signal Layers Only	Length:6486 mils
AD6	Signal Layers Only	Length:9824 mils
AD7	Signal Layers Only	Length:9897 mils

AD8 Signal Layers Only Length:5704 mils

AD9 Signal Layers Only Length:5044 mils

ALE Signal Layers Only Length:3223 mils

CLKOUT Signal Layers Only Length:1803 mils

GNDD Signal Layers Only Length:575 mils

NetC20\_MINUS Signal Layers Only Length:241 mils

NetC20\_PLUS Signal Layers Only Length:483 mils

NetC21\_PLUS Signal Layers Only Length:200 mils

NetC24\_MINUS Signal Layers Only Length:200 mils

NetC24\_PLUS Signal Layers Only Length:200 mils

NetC25\_PLUS Signal Layers Only Length:306 mils

NetJ1\_1 Signal Layers Only Length:600 mils

NetJ1\_2 Signal Layers Only Length:600 mils

NetJ1\_4 Signal Layers Only Length:3726 mils

NetJ1\_5 Signal Layers Only Length:3160 mils

NetJ1\_6 Signal Layers Only Length:600 mils

NetJ1\_7 Signal Layers Only Length:600 mils

NetJ1\_8 Signal Layers Only Length:3529 mils

NetJ1\_9 Signal Layers Only Length:3646 mils

NetJ3\_2 Signal Layers Only Length:1545 mils

NetJ3\_3 Signal Layers Only Length:1692 mils

NetJP2\_1 Signal Layers Only Length:1173 mils

NetJP3\_C1 Signal Layers Only Length:970 mils

NetJP3\_C2 Signal Layers Only Length:400 mils

NetR1\_A Signal Layers Only Length:626 mils

NetR2\_A Signal Layers Only Length:362 mils

NetR3\_A Signal Layers Only Length:509 mils

NetR4\_A Signal Layers Only Length:341 mils

NetR5\_B Signal Layers Only Length:383 mils

NetR6\_B Signal Layers Only Length:321 mils

NetRN1\_10 Signal Layers Only Length:1595 mils



NetRN1\_4 Signal Layers Only Length:471 mils  
NetRN1\_5 Signal Layers Only Length:3779 mils  
NetRN1\_7 Signal Layers Only Length:1967 mils  
NetRN1\_8 Signal Layers Only Length:1975 mils  
NetSW1\_1 Signal Layers Only Length:2448 mils  
NetSW1\_15 Signal Layers Only Length:1578 mils  
NetSW1\_16 Signal Layers Only Length:1295 mils  
NetU10\_5 Signal Layers Only Length:508 mils  
NetU11\_2 Signal Layers Only Length:524 mils  
NetU2\_22 Signal Layers Only Length:2251 mils  
NetU2\_25 Signal Layers Only Length:4949 mils  
NetU2\_26 Signal Layers Only Length:4381 mils  
NetU2\_27 Signal Layers Only Length:3874 mils  
NetU4\_35 Signal Layers Only Length:941 mils  
NetU4\_41 Signal Layers Only Length:1327 mils  
NetU7\_5 Signal Layers Only Length:591 mils  
PWRLO Signal Layers Only Length:2776 mils  
RX232 Signal Layers Only Length:1388 mils  
TX232 Signal Layers Only Length:947 mils  
VBB Signal Layers Only Length:5751 mils  
~BHE Signal Layers Only Length:1866 mils  
~CEOUT Signal Layers Only Length:2412 mils  
~EXTRES Signal Layers Only Length:754 mils  
~RAMHWR Signal Layers Only Length:4052 mils  
~RAMLWR Signal Layers Only Length:1991 mils  
~RAMRD Signal Layers Only Length:4086 mils  
~RD Signal Layers Only Length:2026 mils  
~RESIN Signal Layers Only Length:3955 mils  
~WR Signal Layers Only Length:2973 mils

## Test Point Report

Net	Name	X Coord	Y Coord	Side	Hole Size	Type
A7	U2-10	4850mil	5600mil	Top	38mil	Through hole
+5V	RN1-1	3375mil	2925mil	Top	38mil	Through hole
	J3-SYSPAD10	1219mil	2426mil	Top	124mil	Through hole
+5V	U4-23	4225mil	3875mil	Top	38mil	Through hole
	J2-SYSPAD11	1219mil	4760mil	Top	124mil	Through hole
	Free-0	6450mil	2425mil	Top	156mil	Through hole
GNDD	C10-A	3550mil	4825mil	Top	38mil	Through hole
	J1-SYSPAD11	1819mil	4760mil	Top	124mil	Through hole
A7	U2-10	4850mil	5600mil	Bottom	38mil	Through hole
+5V	RN1-1	3375mil	2925mil	Bottom	38mil	Through hole
	J3-SYSPAD10	1219mil	2426mil	Bottom	124mil	Through hole
+5V	U4-23	4225mil	3875mil	Bottom	38mil	Through hole
	J2-SYSPAD11	1219mil	4760mil	Bottom	124mil	Through hole
	Free-0	6450mil	2425mil	Bottom	156mil	Through hole
GNDD	C10-A	3550mil	4825mil	Bottom	38mil	Through hole
	J1-SYSPAD11	1819mil	4760mil	Bottom	124mil	Through hole

## Pick and place Report

Designator	Footprint	Mid X	Mid Y	Ref X	Ref Y	Pad X	
U3	DIP28N	6000mil	4850mil	5850mil	5500mil	5850mil	
SW1	SW8POSRA	1300mil	5375mil	1250mil	5725mil	1250mil	
U2	PLCCSOCKET68	4450mil	5100mil	4950mil	5100mil	4950mil	
U1	DIP28N	6000mil	3150mil	5850mil	3800mil	5850mil	
Z3	RES600	2525mil	3725mil	2225mil	3725mil	2225mil	
U4	PLCCSOCKET84	4225mil	3375mil	4825mil	3375mil	4825mil	
J3	DB9F	1219mil	2918mil	1275mil	2700mil	1275mil	
J2	DB9F	1219mil	4268mil	1275mil	4050mil	1275mil	
R7	RES500	2725mil	5175mil	2725mil	4925mil	2725mil	
U6	DIP8	2375mil	5025mil	2525mil	4875mil	2525mil	
C15	CAP200	2375mil	5350mil	2475mil	5350mil	2475mil	
U9	DIP8	2375mil	5675mil	2525mil	5525mil	2525mil	
JP3	JUMPER	2725mil	5675mil	2725mil	5725mil	2725mil	
Z1	RES600	2525mil	3925mil	2225mil	3925mil	2225mil	
Z2	RES600	2525mil	4325mil	2225mil	4325mil	2225mil	
Z4	RES600	2525mil	4125mil	2225mil	4125mil	2225mil	
Z5	RES600	2725mil	2375mil	3025mil	2375mil	3025mil	
C8	CC1206	3958mil	2400mil	4025mil	2400mil	4025mil	
C12	CAP200	2375mil	4700mil	2475mil	4700mil	2475mil	
W1	JMP3	3675mil	4400mil	3775mil	4400mil	3775mil	
C7	CC1206	3958mil	2550mil	4025mil	2550mil	4025mil	
C22	CAP200	3125mil	2700mil	3125mil	2800mil	3125mil	
JP2	JMP2	3375mil	2625mil	3375mil	2675mil	3375mil	
U5	DIP6	3225mil	4925mil	3075mil	5025mil	3075mil	
U10	DIP6	2775mil	2700mil	2925mil	2600mil	2925mil	
C10	CAP200	3550mil	4925mil	3550mil	4825mil	3550mil	
C9	CAP200	3125mil	3600mil	3125mil	3500mil	3125mil	
C19	CAP200	2425mil	2700mil	2425mil	2600mil	2425mil	
C25	CAP100RP	1725mil	2650mil	1725mil	2600mil	1725mil	
U12	DIP16	2075mil	2950mil	1925mil	3300mil	1925mil	
J1	DB9F	1819mil	4268mil	1875mil	4050mil	1875mil	
C5	CC1206	5995.5mil	5700mil	6062.5mil	5700mil	6062.5mil	
C6	CC1206	4479.5mil	4162.5mil	4412.5mil	4162.5mil	4412.5mil	41
C14	CAP200	2900mil	5725mil	2900mil	5625mil	2900mil	
C13	CAP200	3550mil	5725mil	3550mil	5825mil	3550mil	
C17	CAP200	2900mil	5325mil	2900mil	5225mil	2900mil	
C16	CAP200	3550mil	5325mil	3550mil	5425mil	3550mil	
U7	DIP6	3225mil	5725mil	3375mil	5625mil	3375mil	
U8	DIP6	3225mil	5325mil	3375mil	5225mil	3375mil	
Y1	DIP8	3225mil	4250mil	3075mil	4400mil	3075mil	
C18	CAP200	3125mil	3150mil	3125mil	3050mil	3125mil	
U11	DIP6	2775mil	3200mil	2625mil	3300mil	2625mil	
R2	RES500	1800mil	5375mil	1550mil	5375mil	1550mil	
R6	RES500	1800mil	5075mil	2050mil	5075mil	2050mil	
R3	RES500	1800mil	5675mil	1550mil	5675mil	1550mil	
C23	CAP200	2425mil	3200mil	2425mil	3300mil	2425mil	
C24	CAP100RP	1725mil	2950mil	1725mil	2900mil	1725mil	
C21	CAP100RP	1725mil	3250mil	1725mil	3200mil	1725mil	
C20	CAP100RP	2075mil	3500mil	2125mil	3500mil	2025mil	
Z6	RES600	1925mil	2375mil	2225mil	2375mil	2225mil	
C2	CC1206	5995.5mil	4000mil	6062.5mil	4000mil	6062.5mil	
C4	CC1206	4554.5mil	4425mil	4487.5mil	4425mil	4487.5mil	
C1	CAP200	3225mil	4625mil	3325mil	4625mil	3325mil	
R1	RES500	1800mil	5825mil	1550mil	5825mil	1550mil	
R5	RES500	1800mil	5525mil	2050mil	5525mil	2050mil	
R4	RES500	1800mil	5225mil	1550mil	5225mil	1550mil	
C3	CC1206	3737.5mil	5054.5mil	3737.5mil	4987.5mil	3737.5mil	49
RN1	SIP10	3375mil	3375mil	3375mil	2925mil	3375mil	
C11	CAP200	2900mil	4925mil	2900mil	5025mil	2900mil	







